SECO UNIT SYSTEM

UNI-SECO STRUCTURES LIMITED
GREAT BRITAIN

SECO

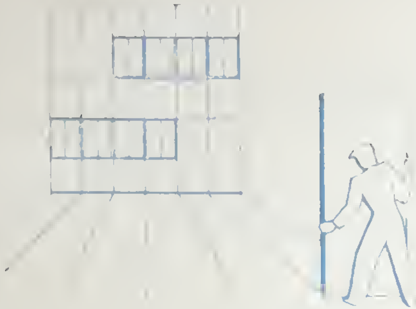
A GENERAL

B STANDARD SIZES

C DESIGN

D

E



"SECO" UNIT SYSTEM

GENERAL INFORMATION AND DATA SHEETS

ISSUED BY UNI-SECO STRUCTURES LTD
6 WOODS MEWS, PARK LANE, LONDON, W.1 TELEPHONE MAYFAIR 6661

UNI-SECO STRUCTURES LIMITED

DIRECTORS

G. WIGHAM RICHARDSON
CHAIRMAN

BERNARD BRUNTON
MANAGING DIRECTOR

R. LUCRAFT

B. P. HUGHES PRESTON, A.C.A.
SECRETARY

SECO
UNIT
SYSTEM

GENERAL MANAGER
W. A. BALMAIN, B.SC., A.I.C.

CHIEF ARCHITECT
R. G. BOOTH
A.R.I.B.A., A.A., DIP.

CHIEF CHEMIST
H. ROSE
B.SC., A.I.C., A.M.I.CHEM.E.

DEVELOPMENT CONSULTANT
G. FEJER
DIP.ING.ARCH.E.T.H. (ZURICH)

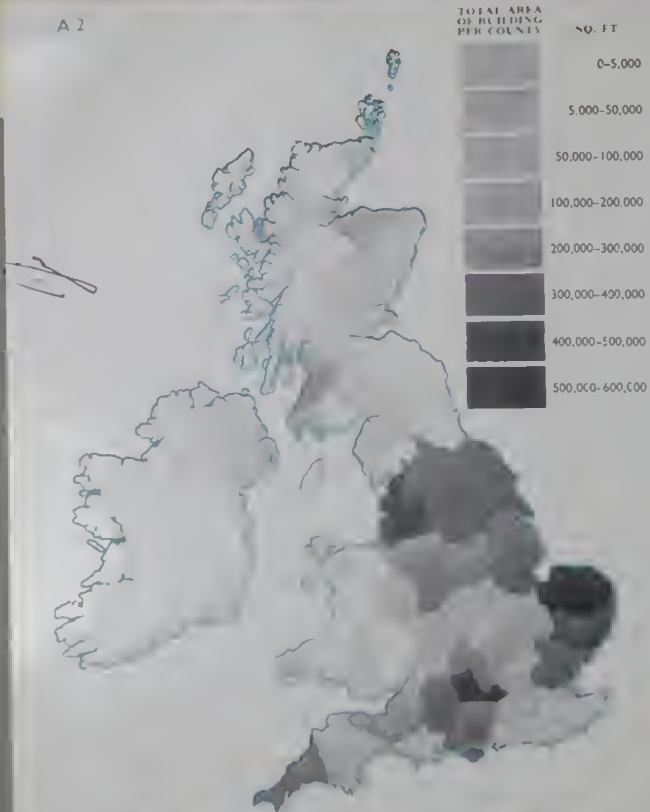
HEAD OFFICE: 6 WOODS MEWS, PARK LANE, LONDON, W.1
BCM SECO TELEGRAPHIC ADDRESS: UNISECO, AUDLEY, LONDON TELEPHONE: MAYFAIR 6661 (5 LINES)

B
STANDARD SIZES

C
DESIGN

D

E



"SECO" BUILDINGS SUPPLIED COVER AN AREA OF OVER 5,000,000 SQUARE FEET, DISTRIBUTED ON OVER 600 SITES.

INTRODUCTION

THE main object of this booklet is to provide, in a detailed manner, information concerning the "SECO" system for those who, during recent months, have shown such interest in prefabrication in general, and in our system in particular.

It is opportune that the booklet should appear at this time, in a period of so much writing and discussion on the subject, and when the Government has begun to acknowledge the fact that prefabrication must play an essential part in immediate post-war housing.

Much of the talk and writing has been of a purely theoretical nature. The information contained here should, therefore, be the more valuable since it is based on fact and on experience. It should help to dispel the idea, that is being fostered in some quarters, that architects and contractors will lose their housing work when systems of prefabrication are established.

This is no occasion to write a history of the origin and development of the "SECO" system. The story may one day be written and would make interesting reading. Suffice to say that "SECO" was conceived in the grim days of September, 1940, when the war building programme was in its infancy, and when the Government was faced with the problem of housing the thousands of workers who would be needed in the new factories. It seemed obvious that traditional methods could not provide quickly enough all the accommodation that was needed. The answer lay in a revolutionary system of rapid building, employing a high percentage of unskilled labour in the factory, eliminating all unnecessary site work, and using materials in good supply. Believing this, we set out to design such a system and so "SECO" was evolved. We have succeeded, not without difficulties, in establishing a new industry

and in creating a nation-wide organisation, embracing manufacture, storage, distribution and site assembly; an organisation which is alive and ready instantly to play its part in the work of reconstruction, as energetically as it is now contributing to the fulfilment of war emergency undertakings.

This organisation is a new one. It is, in fact, little over two years since the first officially ordered "SECO" building was completed. Yet, in the interval, we have supplied "SECO" units and components from which hundreds of different types of buildings have been erected, covering an area of some five million square feet, which is the equivalent of between five and six thousand peace-time houses. We have functioned on over six hundred sites, and nearly 200 firms, from the largest civil engineering contractors to the small local builders, have successfully and enthusiastically engaged in the work of erection.

We have established manufacturing centres at twenty-six different factories, most of which employ a large proportion of girl labour. We have proved that it is possible to design a unit system—a true system of prefabrication, which is simple in manufacture, presents no difficulties in transport, is quickly and easily erected, and which employs at every stage a balance of skilled and unskilled labour. We have had ample experience of single-storey domestic dwellings, erected as married quarters for war-time building schemes. More recently, we have introduced a two-storey building, opening up unlimited possibilities for the design of prefabricated houses under the guidance of the architect.

We have tried throughout to maintain a co-operative attitude, and will continue to do so, in the conviction that the needs of the country can only be met fully by a real collaboration in the industry.

We are not bound in our system to any particular material, and we intend to remain sufficiently flexible to be able to make the best use of every development in building science. To this end, we have established departments for design, technical research and development, staffed by experienced architects, chemists and engineers, whose aim is to study materials and their proper use, to make improvements and to keep contact with firms in allied industries, whose products can play a vital part in the proper equipment of our future homes.

The work which we have done has, we believe, proved a valuable contribution to the war effort—an effort of which we can be proud. Its accomplishment has been possible only through the confidence and whole-hearted collaboration of all our Manufacturing Centres. To them we extend our grateful thanks, as also to the technical and other departments of the Ministry of Works, for many helpful criticisms and suggestions and for their unfailing courtesy at all times.

In deciding to publish the booklet now, we have a further object. We hope that it will assist in clarifying the real issue in prefabrication; that it will answer many questions being asked and set at rest many of the fears expressed.

Prefabrication cannot eliminate traditional methods of construction, which themselves must profit by the developments of science—but prefabrication, in one form or another, is destined to play its part in our future building programmes. It is for the people of this country to ensure that this new industry acquires a tradition of its own, and assumes its rightful place in serving the needs of the community.

THE CASE FOR UNIT CONSTRUCTION

THE G[illegible]unced that in England and Wales alone [illegible] four [illegible] be required in the ten years immediately [illegible] no further losses are suffered through [illegible] allowing for normal deterioration. It is [illegible] that a new building technique must be employed [illegible] the houses that are needed.

[illegible] spent twenty years in building four million [illegible] war, public attention has been focused [illegible] some of the army camps and hostel towns [illegible] the potentialities of prefabrication of buildings [illegible] have been the subject of much discussion [illegible] Statements concerning prefabrication have been [illegible] some praising, some condemning, but all [illegible] be too general or too sweeping in their views.

[illegible]on" is not altogether a happy choice. It [illegible] number of ways, and there has been little [illegible] its meaning as applied to building con[illegible] people, it conveys the impression of extreme [illegible] a landscape marred by colonies of [illegible] box-like structures, without soul, without light [illegible] architectural relief. Such a vision could well [illegible] there are in existence many so-called "systems" of prefabrication which offer no more than super-standardisation and which leave no latitude for planning. Such systems, while adequate for the exigencies of war-time should have no part in post-war permanent housing plans.

Prefabrication is a matter of degree. It means, simply stated, the factory production of composite building units for dry assembly on the building site.

Some hundreds of systems of prefabrication have been developed in recent years. The majority are based on the principle of manufacturing large sections, even to the size of a room, which, when assembled, provide a building of predetermined and inflexible dimensions. Many such buildings are pleasing in appearance and cleverly planned. They have acquired a deserved popularity with certain sections of the American public. They are essentially the product of well-organised manufacture, but they do not, and cannot, express the individuality of the owner, and we believe that the majority of the British public prefer to decide for themselves, at any rate within reasonable limits, the shape and size of rooms, the position of windows and doors, and the quality and variety of interior fittings, when their homes are built.

The "SECO" system has been designed with this object in view. IT IS AN ENTIRELY NEW METHOD OF CONSTRUCTION, simple and flexible, but none the less a logical development of building practice. It has been evolved through the practical application of scientific developments in building materials and the correct use of modern methods of factory production and transportation in the most economical manner.

In mediæval times, building technique was based on the need to man-handle raw materials to the site and there to set up a "temporary" factory for cutting and shaping these materials, and preparing the binding medium. In those days, there was no alternative, but in the present age of factory production, there is no need for the building industry to cling to methods whose chief recommendation is their background of tradition.

The "SECO" system puts building for modern times into the right perspective by employing the time-saving and labour-saving methods of the factory without restricting the freedom of the designer. Indeed, the system provides the designer with a new and flexible medium to give effect to his ideas. Equally important, it contributes a new technique that will help in meeting the urgent national need for house building at a speed quite impossible of attainment if traditional methods are to set the tempo of post-war construction.

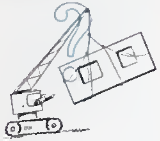
WHICH IS THE EFFICIENT UNIT OF CONSTRUCTION?

When faced with the problem of supplying a large number of buildings in a short time, the first factor to be determined is the economic size of the unit of construction, bearing in mind that the Unit must be a repetitive and mass-produced part.

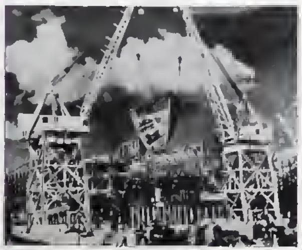
THE HOUSE AS THE UNIT

To produce a dwelling-house in a single unit must result in over-standardisation, with too much repetition of design. This in turn would lead to the monotonous form of architecture so prevalent in the nineteenth century. It might also lead to over-centralisation of production and would certainly lead to great difficulties in transportation, at any rate in this country, in which so many low bridges and narrow roads are encountered.

THE WALL AS THE UNIT



A unit large enough to provide a complete wall, or a room, has been tried with advantage—with mass production of identical houses as the aim. The principle has also been used in the construction of ships, where no variation of design has been required. But if individuality is to be maintained and architectural guidance and advice enlisted, then a whole wall or a whole room is too large a unit.



THE BRICK AS THE UNIT

For centuries the brick has been the traditional unit of construction. It is light, strong and flexible; it provides ample scope for variety in design. But it has disadvantages. The need for a wet joint makes bricklaying impossible in wet weather, and wet construction entails a long drying-out period. The small dimensions of the unit itself make the business of erection unnecessarily slow.

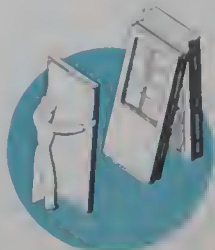
B STANDARD SIZES
C DESIGN
D
E

"SECO" UNITS FULFIL ALL REQUIREMENTS

... "SECO" units have been established after ... research into existing standard sizes of building ...ts, windows, doors and so forth, and after con... the basic requirements of building practice. The ... designed to provide a large degree of standardisa... They are large enough to make speedy assembly ... all weathers, but not too large to hamper ... design.

...y of planning is achieved by the adoption of a ... of units, the measurements of which bear relationship ... other. The construction of wall and roof units ...lly identical, so that the thermal insulation value ...CO" building is virtually the same at roof and wall ... addition to high insulating qualities, "SECO" ...s resistance to weather, high tensile and com...ngth, and impact resistance.

... data ... Physical Properties," Section "F"



The units employed in the "SECO" system may be classified broadly thus:

WALL AND ROOF UNITS

Wall and roof units have a rigid insulating core of wood wool bonded with cement, faced on both sides with flat asbestos cement sheets and enclosed on all four edges by a light timber frame. The whole forms a composite block of internal cellular construction, light, strong and with high insulating qualities.

BEAMS, COLUMNS AND EAVESPIECES

The beams, columns and eavespieces are made from resin-bonded plywood. They are hollow, diaphragm structures, capable of supporting heavy loads. Eaves-pieces form the connecting link between the walls and roof.

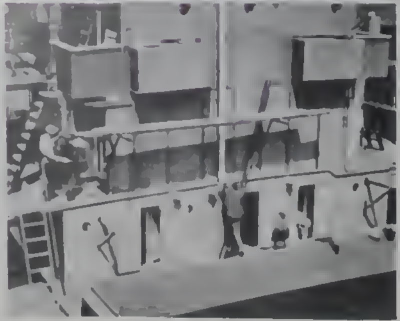
In buildings with clear floor spans, where uninterrupted open floor space is required, the beams and columns act as the supporting frame for the roof. They are not used in buildings planned for domestic or similar purposes, in which the internal partition units carry the roof loads.

COMPONENT PARTS

Components, made from light timber sections, include roof spars, cross ties, keelplates, packing posts and door frame units.

STANDARD "SECO" UNITS • ARCHITECTS' DESIGN • INDIVIDUAL TASTE

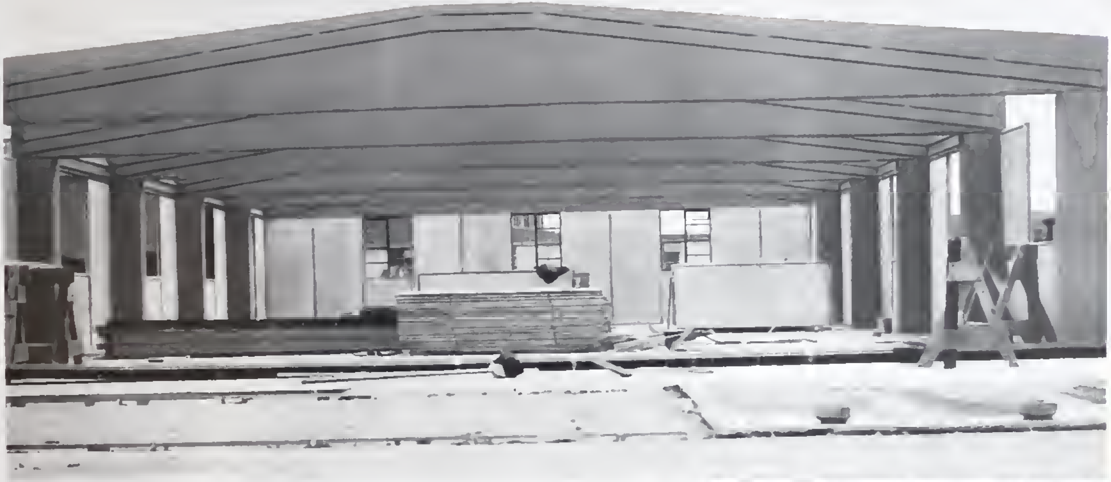
B STANDARD SIZES
C DESIGN
D RECTION
E PHYSICAL ROPERTIES



THE LESSONS OF SHIPS

A TECHNIQUE evolved in one industry can often be adapted and used to advantage in another. For example, there are many points of similarity between building and shipbuilding. Evidence of this is found in the open floor type of "SECO" building, where beams and columns provide the main structural bracing, and the wall and roof units perform the function of insulating panels.

The principle of "dry" assembly, shown in the photograph on the left, has been proved in shipbuilding, where water-tightness and rigidity are essential factors. There is no reason why the



B
STANDARD SIZES
C
DESIGN
D
E

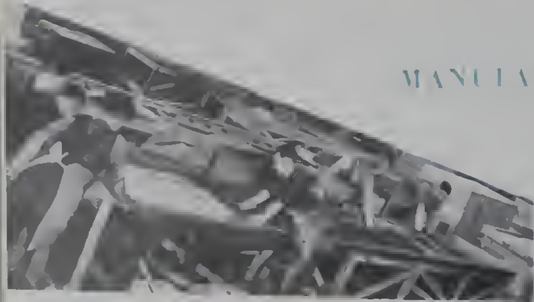
BUILDING TECHNIQUE

same principle, if not the same materials should be any less successful and efficient when applied to building construction.

The photograph above shows a war-time open floor "SECO" building in course of erection. The beams have a span of 35 feet. The purpose for which the building was required made it essential that it should provide conditions which could normally be expected from conventional types of construction. Such a building as this is providing a valuable fund of experience for application in the post-war period.

WORKSHOP AND FACTORY-MADE UNITS CAN BE

MANUFACTURE



FULL advantage is taken of modern workshop practice in the production of units and components for the "SECO" system. In traditional building much time is lost by skilled craftsmen, whose speed of production on the site is restricted by the overlapping of trades and other factors beyond their control. The aggregate of such lost hours of skilled labour is often equal to, or even in excess of, the number of productive hours for a given operation. Weather conditions also impede progress and impair the quality of the workmanship.

In the workshops and factories all operations are controlled. Work is correctly divided between skilled and unskilled labour. A new type of skill and craftsmanship develops. Women, hitherto excluded from building work, now find their place in it. Summer or winter, production goes on steadily in conditions favourable to the health of the operatives. Benches, jigs and other fatigue- and labour-saving appliances are employed. Cements, adhesives and other materials are protected from risk of exposure before use. Workers travel in a normal manner and there are no long tedious and

ASSEMBLED QUICKLY AND ACCURATELY

wasteful journeys to inaccessible sites.

These are a few of the salient advantages to be gained from factory production, as compared with site work in building; advantages reflected in higher quality and lower cost, in greater accuracy and precision, and consequent speeding up of production at all stages.

For the process of erection a minimum of labour is required. Cutting away and making good are eliminated, since every screw hole is drilled in the factory, and every unit and component arrives ready to slide into position.

Assembly is "dry"; decoration can be carried out immediately without risk of deterioration, and occupation is not delayed during a drying-out period.

No elaborate machinery need be used on site; every operation is studied from the point of view of eliminating unnecessary fatigue.

A "flying squad" of skilled demonstrators is maintained to give advice and guidance on erection. The system is simple and the unskilled workman quickly acquires a mastery of assembly technique.

ERECTION

At a "SECO" regional store

TRANSPORTABILITY

A new and additional condition is imposed upon prefabricated units. They must withstand the strain of transportation. The utmost attention has been given to questions of weights, sizes and impact resistance of all materials used in the production of "SECO" units.

The largest wall unit weighs about 200 lb., it is rigid, its surfaces are tough, its edges are protected and it is designed for easy handling, storage and transportation under all conditions which can be reasonably expected.

The mobility of all "SECO" units is one of the most important features of the system. The beams, columns, roof units

and all other components can be transported in the same speedy and economic manner.

The lorry below is carrying all the "SECO" Units, Beams, Columns and component parts required for the erection of a standard size army hutment, measuring 60 ft. by 19 ft.; even the windows, bolts, screws and "Secomastic". The total weight is less than 8 tons.

The men below are carrying a 24-ft. span "SECO" "Aero" Beam. Its weight is approximately $2\frac{1}{4}$ cwts.

Those on the right are carrying a standard No. 1 Wall Unit, giving a wall area of 23 square feet.

These weights make interesting comparison with the weights of traditional materials of similar spans and areas.

LIGHT, STRONG AND TOUGH UNITS

B STANDARD SIZES
C DESIGN
D
E

WAR-TIME

ALTHOUGH the development of the "SECO" system has taken place since the outbreak of the war, it was primarily designed to meet domestic requirements. The original plans were based on the *cellular* constructional system, in which the roof loads are carried on the internal partitions. Subsequently, the demand for open-floor type buildings took precedence over domestic requirements, and the beam and column construction was evolved to meet it.

Hutting for the housing of service personnel was one of the first war-time needs.

MESSROOMS

RECREATION HALL

KITCHENS

•

HUTS

OFFICES

STORES

BUILDINGS

and the "SECO" system was adapted to meet the requirements of standard Ministry drawings. "SECO" has provided a great number of these standard type hutments during the national emergency. What is more important, buildings such as hospitals, canteens, offices and living quarters, normally constructed by conventional building methods, have been provided by the "SECO" system. These buildings, of which there are examples all over the British Isles, represent war-time architecture for utilitarian purposes. They do not pretend to be the prototypes of

WAR-TIME

"SECO" buildings for normal civilian needs.

During the war, camouflage has been more essential than pleasing appearance. Nevertheless, it is easy to see how the "SECO" system lends itself to planning with unlimited flexibility. Most of the illustrations we are permitted to publish show single storey type buildings, looking somewhat similar externally. Some of the photographs of interiors, however, emphasise the wide variety of pleasing effects which can be secured by the use of standard units, even in war time.

BUILDINGS

War-time building suggests "temporary" construction almost automatically, but war-time "SECO" buildings are by no means "temporary" in the sense that their life is restricted to a few years. All the basic materials used in the construction of the system are known, well tested in the usage, and, being themselves of a permanent character, it may be reasonably assumed, therefore, that in their combined form they will prove durable over a long period; subject, of course, to reasonable maintenance being given.

B STANDARD SIZES
C DESIGN
D ERECTION
E PHYSICAL PROPERTIES

Top left
INDUSTRIAL BUILDINGS

Bottom extreme left
CANTEENS

Left
STANDARD HUTS

•

Right
HOSPITAL BUILDINGS

LIVING QUARTERS

At first glance, the interiors on this page give the impression of domestic planning and it is so in fact, for here is a building of standard "SLCO" units erected as living quarters for Service personnel on an important air station.

To divide a hut after erection often results in cramping the accommodation. The same units as would make the hut and its partitions could, by elementary planning, be disposed to give more comfort and better room sizes, erected just as speedily and at no greater cost per foot super of area covered.

These examples, together with those on the following pages, may well be regarded as transitional planning in "SLCO", foreshadowing its peace-time possibilities.

AGRICULTURAL WORKERS' COTTAGES

"SECO", this time to a standard M.O.W. plan of accommodation. Erected in pairs to meet an emergency as vital to the country as the prosecution of the war itself, these cottages are the war-time homes of Key Agricultural Workers. In them, they have found conditions and amenities with which they can live contentedly: good insulation, freedom from condensation, pleasing decorative effects, notwithstanding the somewhat formal elevation called for by official rulings.

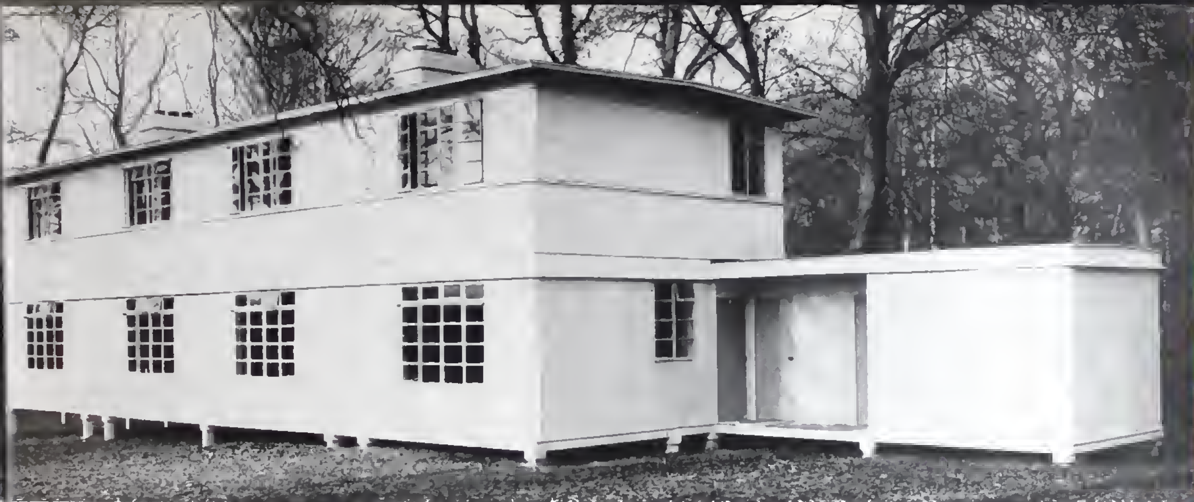
TRANSITION

[illegible]

[illegible] it will be necessary to face the period [illegible] de homes of a "temporary" nature, [illegible] d[illegible]ns as to future "permanent" schemes.

SECO [illegible] preparing. The building above represents a [illegible]dard type "hutment", of which thousands are [illegible] planned and re-erected as a bungalow.

It [illegible] been [illegible]d that demobilised men will not care to live [illegible] hutments in which, during the war, they have [illegible] a time. "SECO" huts are only huts when [illegible] when dismantled, they become units and [illegible] re-erection to any plan to suit the needs of [illegible].



RECONSTRUCTION

LOOKING TO THE FUTURE NEEDS OF THE COUNTRY

By extending the system to multi-storey construction, "SECO" has progressed beyond the immediate war requirements in buildings.

Still employing standard wall and roof units, this double storey pair of houses was made possible by the inclusion in the range of "SECO" components of a plywood floor unit and a plywood intermediate wall beam.

Details of these appear on page 16, Section "B".]

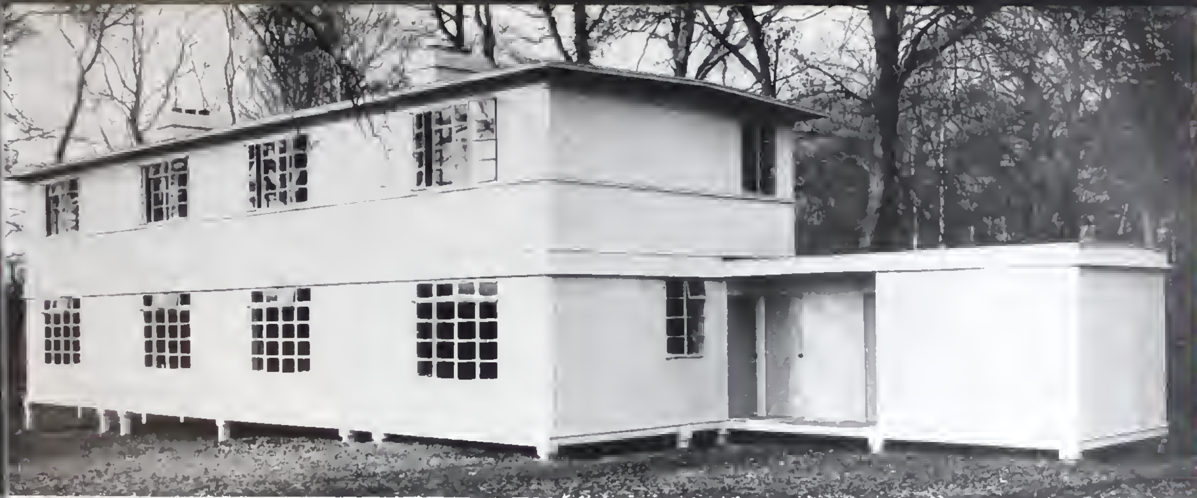
Demountability is considered a desirable factor; therefore, this has been demonstrated to its logical conclusion by placing the building, not on permanent foundations, difficult and costly to remove, but on light concrete piles, which can easily be withdrawn.

TRANSITION

WHEN the time comes, it will be necessary to face the period of transition, to provide homes of a "temporary" nature, pending major decisions as to future "permanent" schemes.

"SECO" is preparing. The building above represents a recovered standard type "hutment" of which thousands are in war-time use, planned and re-erected as a bungalow.

It has been said that demobilised men will not care to live in the types of hutments in which, during the war, they have spent so long a time. "SECO" huts are only huts when erected as such; when dismantled, they become units and components for re-erection to any plan to suit the needs of the future.



RECONSTRUCTION

LOOKING TO THE FUTURE NEEDS OF THE COUNTRY

By extending the system to multi-storey construction, "SECO" has progressed beyond the immediate war requirements in buildings.

Still employing standard wall and roof units, this double storey pair of houses was made possible by the inclusion in the range of "SECO" components of a plywood floor unit and a plywood intermediate wall beam.

Details of these appear on page 16, Section "B".]

Demountability is considered a desirable factor; therefore, this has been demonstrated to its logical conclusion by placing the building, not on permanent foundations, difficult and costly to remove, but on light concrete piles, which can easily be withdrawn.

HOUSES

FUTURE USES OF "SECO" UNITS

THERE must inevitably be an interval, after the war, before industries can adjust themselves to peacetime production, and before scientific developments inspired by war exigencies can be suitably adapted to peace-time use. The Government have announced that an "interregnum" of two years is visualised, so far as the building industry is concerned. There is no doubt that, during this period, considerable progress in the application of new materials will be made which in turn will have a decisive influence on building construction.

During the "time of waiting", the present "SECO" units will be particularly suitable for urgent housing and industrial building needs. Not only will there be many war-time buildings whose object and purpose will have been fulfilled and which will become redundant and ready for dismantling. There will also be extensive stocks of units and components immediately available to architects and all authorities charged with the responsibility of finding intermediate

TERRACE HOUSES ★ EXTENSIONS ★

AND COMPONENTS

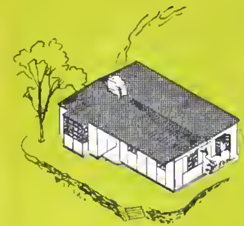
accommodation, pending the adoption of reconstruction schemes.

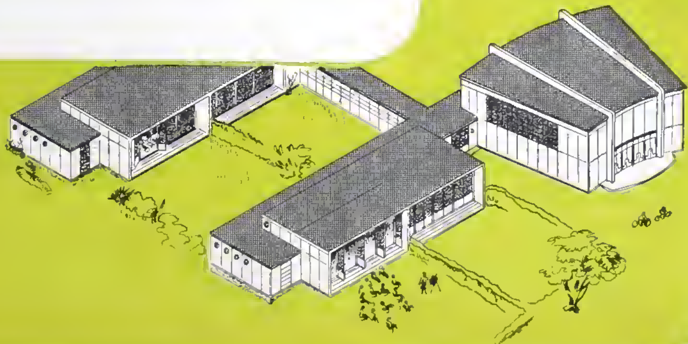
The advantages of "SECO" for this purpose are overwhelming. Buildings can be erected on existing rafts or piles, even when it is apparent that town planning schemes will require their subsequent removal. When that day comes it will be found that the buildings have a high demolition value, if indeed they are not transferred to other sites for further use.

The demand for buildings is bound to assume enormous proportions here at home, which will be substantially increased by the needs of shelter and accommodation for people in the liberated countries. "SECO" is well suited to fulfil such requirements, whether through manufacture and export of units from this country, or through manufacture abroad.

The drawings on this page give some indication of the wide variety of new buildings, or extensions to existing buildings, which will become available.

B U N G A L O W S





H O L I D A Y H O M E S ★ S C H O O L S

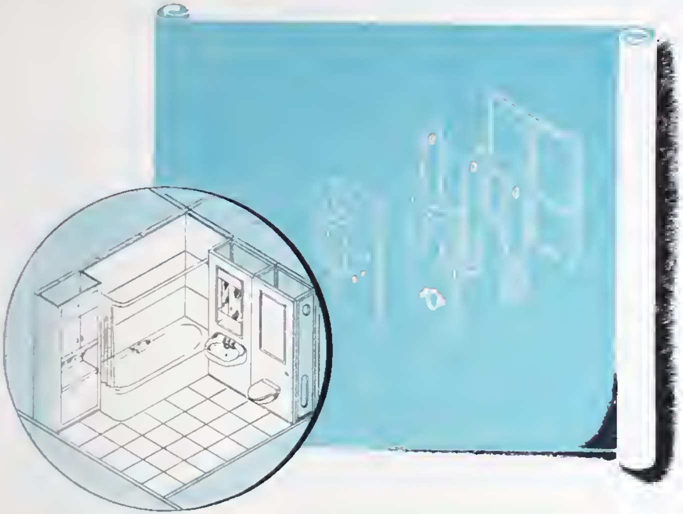
NEW "SECO" UNITS FOR POST-WAR BUILDING

HITHERTO, the "SECO" system has been confined to the production of those units which make up the fabric of a building. It is clear, however, that the practicability and simplicity of the system can be extended outside this restricted sphere. Modern, scientific building construction will demand the co-ordination of the supply of internal fixtures and fittings if full benefit is to be derived from the speedy erection which is one of the most notable of the system's features. During the war, it has been the rule rather than the exception for "SECO" buildings to be erected in a matter of hours or days, and then to be handed over to sub-contractors for heating, lighting, ventilating and decorating, who have delayed the completion and occupation of the building for a far longer period than the time required for erecting it.

- **STAIRS**
- **HEATERS**
- **DECORATIVE PANELS**

"SECO" intend to produce designs for prefabricated stairs with basic standard features, yet with latitude for choice in the final appearance and finish.

Problems in the application of heating, ventilating and air conditioning to prefabricated houses provide great scope for the progressive engineer. The design of "SECO" keelplates and eaves, for the post-war period, will incorporate ducts for air, service pipes and wiring. Heating panel units will constitute a part of the structure.



BATHROOM UNITS

The picture below shows what so often happens when structure and installations are brought together without method or forethought. A combination of "SECO" wall units with mechanical appliances is envisaged, in which all piping and services will be concealed, but none the less accessible for maintenance and repairs.

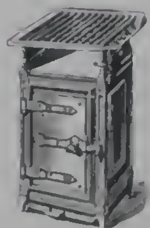
The floor space in a bathroom composed of such co-ordinated units would be clear of obstruction and free from awkward corners and dust-collecting angles

The use of "SECO" bathroom units in this way would not result in rigid standardisation of size, appearance, or even of quality of fixtures. Units will be adaptable to suit local or individual requirements. Bathroom fixtures and fittings will be available in colour schemes to suit personal tastes, and in price ranges to suit varying incomes.

"SECO" Technical and Research Departments are giving careful thought to problems of this nature. The manufacturers of the "SECO" system do not regard it as part of their function to make heating, plumbing or lighting appliances, merely to ensure that they fit into the system. But they invite the full co-operation of those, in any of the industries concerned with installations and fittings, who wish to be associated with this evolution in building construction. Even now, there are, in the blue print stage, a number of schemes to deal with essential features of domestic housing which have been neglected in the past. Typical examples can be seen on pp. 24, 25 and 27.

XIV CENTURY

No services, all necessary appliances built on the site.



XIX CENTURY

Gas, water, etc., became available and appliances take the shape of prefabricated units without regard to the structure of the building.

KITCHENS

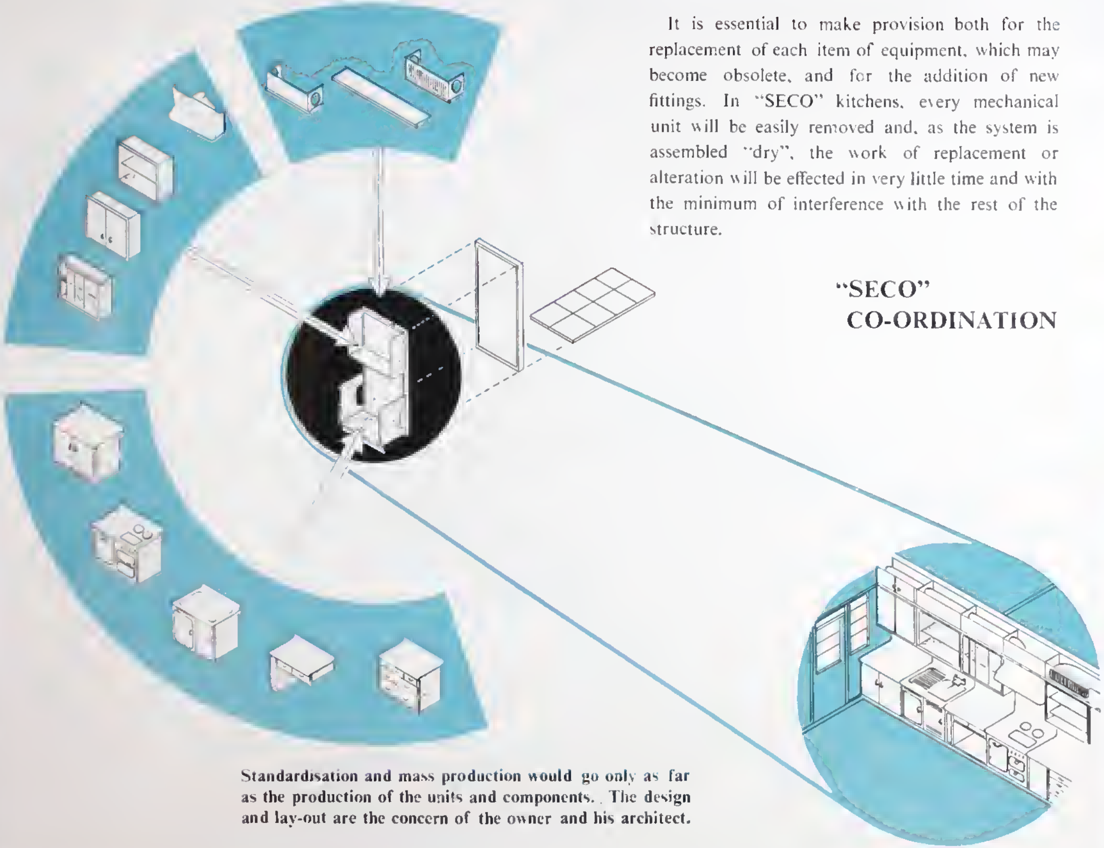
In years past, when every part of a house was built on the site, the kitchen was planned to suit the individual house and functioned with relative efficiency, considering that neither modern equipment nor services were available. Paradoxical though it may seem, the beginning of kitchen "inefficiency" can be traced to the introduction of "prefabrication" in kitchen fixtures. Builders then adopted the principle of constructing the room, and leaving the housewife to gather together the fittings she needed and to place them as best she could. In consequence, stoves, tables, cupboards, refrigerators, etc., were purchased piecemeal and placed haphazardly in the kitchen as they were acquired. Thus structure and appliances were divorced.

The efficient method is to combine structure and equipment in a functional manner. There can be no reason against standardising the measurements of all equipment which will relate, in unit form, to the dimensions of the walling units.

The illustration on the right shows a standard wall unit which can accommodate a series of cabinet units, a sink, or an appliance such as a refrigerator, plate washer or cooker. A kitchen constructed in this way would have a continuous table-top surface and continuous skirting. Such a scheme leaves full scope to individual requirements in regard to the amount of space devoted to the kitchen and its interior arrangements.

It is essential to make provision both for the replacement of each item of equipment, which may become obsolete, and for the addition of new fittings. In "SECO" kitchens, every mechanical unit will be easily removed and, as the system is assembled "dry", the work of replacement or alteration will be effected in very little time and with the minimum of interference with the rest of the structure.

"SECO" CO-ORDINATION



Standardisation and mass production would go only as far as the production of the units and components. The design and lay-out are the concern of the owner and his architect.

A 2

The name "SECO"

originates from the initials of Selection Engineering Co. Ltd. which was responsible for the design and development of the "SECO" Unit System of Construction. It has no connection with any Company or System bearing the same or similar sounding name.

ACKNOWLEDGMENTS [illegible] due [illegible] photographs of the "SECO" [illegible] this book [illegible] photographs [illegible] Press Ltd. [illegible]

W[illegible]

[illegible]

The "SECO" System [illegible]

[illegible]

STANDARD SIZES OF "SECO" UNITS

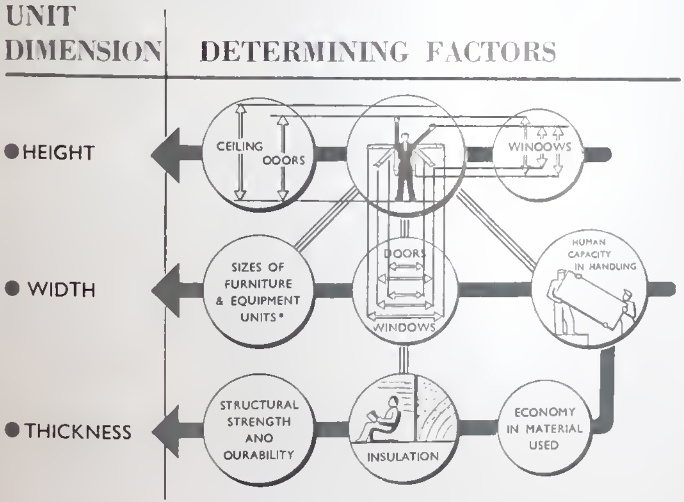
INFORMATION SHEETS ISSUED BY

UNI-SECO STRUCTURES LTD

6 WOODS MEWS, PARK LANE, LONDON, W.1

B STANDARD SIZES
C DESIGN
D ERECTION
E PHYSICAL PROPERTIES

The standard sizes of "SECO" Units are illustrated on the following pages in the simplest possible form, featuring only those measurements which are necessary to enable the designer to plan a building in the "SECO" System. The units described comprise the full range within which all the buildings illustrated in Section "A" of this booklet have been erected. Using the same range of units, it is simple to plan for domestic needs in immediate or post-war buildings.



THE BASIS OF "SECO" STANDARDISATION

Many attempts have been made in recent years to establish a rigidly modular system. In practice, it has not been possible to build in accordance with this ideal. Careful study of the theories forces us to the conclusion that suggested module are not suitable, because of the allowances that must be made for overlapping joints. "SECO" have, therefore, evolved a set of basic measurements, not from any rigid mathematical principle, but bearing a true relationship to average accepted standards of essential features in building, such as door and window sizes, passage widths, room heights and the size of furniture. Traditional dimensions have been determined through long usage, and have their origin in the measurements and normal requirements of the human body. The dimensions of the standard components of the "SECO" system are based on such facts and not on theory.

The sketch on the left shows, in principle, how the "SECO" dimensions have been determined. Heights, widths and levels clearly suggest themselves. The determination of unit thickness is governed by the following essential scientific and practical requirements, which may be classified as follows:

1. Structural strength and durability.
2. Thermal insulation and weather resistance.
3. Limitation and economy in materials available.
4. Limitation of weight for easy handling, transport and erection.

The suitability of the dimensions adopted by "SECO" has been proved in practice.

ON the following pages are illustrations and descriptions of "SECO" Units and Components. It will assist in understanding their purpose if it is made clear at this stage that "SECO" Construction is of two distinct types:

(*a*) **Cellular Construction,** to provide rooms of relatively small dimensions, e.g. for domestic houses, offices, sleeping quarters, etc.

In this type of construction, the internal partitions are built with standard units, similar to those employed for the outside walls. The roof structure is carried on internal eavespieces, which rest on the partitions.

(*b*) **Clear Span Construction,** to provide uninterrupted open floor space.

In this construction the "SECO" "Aero" Beam and Column are used. The roof structure is carried by the beams and the external units.

A combination of clear span and cellular planning is possible, and is, in fact, frequently adopted. It is also possible to increase the normal height of ceiling provided by the standard Wall Unit, by the introduction of a Plinth Unit and, again, combinations of cellular and open floor buildings of both low and high ceiling types are readily obtainable.

"SECO" WALL UNITS

The drawing on the right shows an imaginary assembly of Wall Units, forming a structure of composite type. Doors and windows of varying size can be included by the selection of appropriate units.

"Seco" Door Units are of frame construction, of a section and dimension interchangeable with Wall Units. The internal dimensions of the frame of the Door Units correspond with the standard sizes of external or internal doors. By reversing the Door Frame Unit, the swing of the door can be varied as desired.

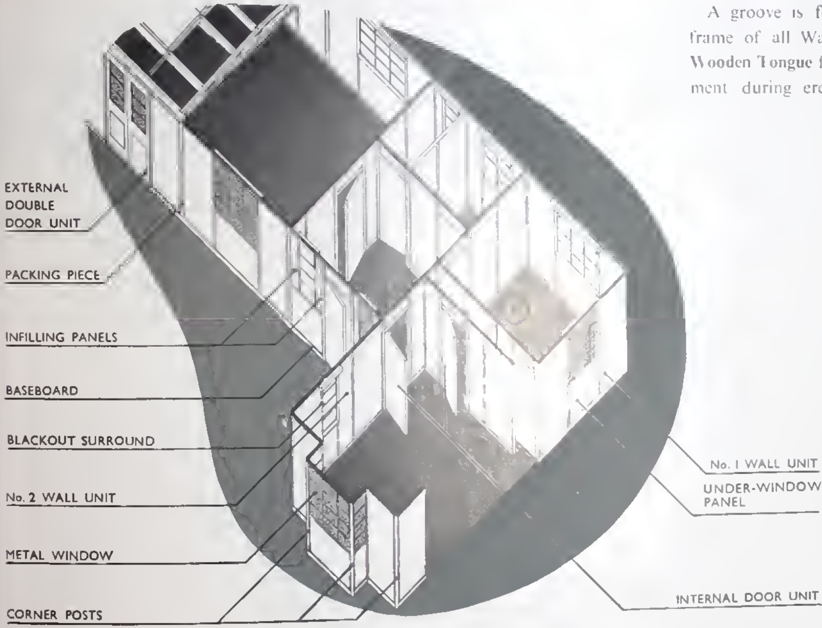
The Under-window Panels are interchangeable with other units. Thus, window openings to suit varying sizes of wood or metal window can be placed at will. Under-window panels can also be used to provide serving hatches, borrowed lights, or for the formation of recesses.

The width of a standard window opening may be reduced by the introduction of small **Window Infilling Panels**.

The general arrangement of the various units, in walling, is a matter for individual taste, though obviously, from the point of view of speed of erection and economy, the use of the larger units is desirable. The judicious use of half-, or three-quarter-size units gives scope for the creation of attractive interior panelling effects.

In conjunction with Wall Units, a number of solid small section timber components are employed in the process of erection. **Packing Posts** are used for the making up of half-wall thickness, such as the right-angle junctions of internal partitions. **Packing Pieces** between units in the line of walling are used to compensate for the sectional thickness of partitions. **Corner Posts** are employed at the external corners of buildings.

All Wall Units rest on a timber **Keelplate.** The keelplates are provided with hook bolts, which are eventually keyed to the foundation raft.



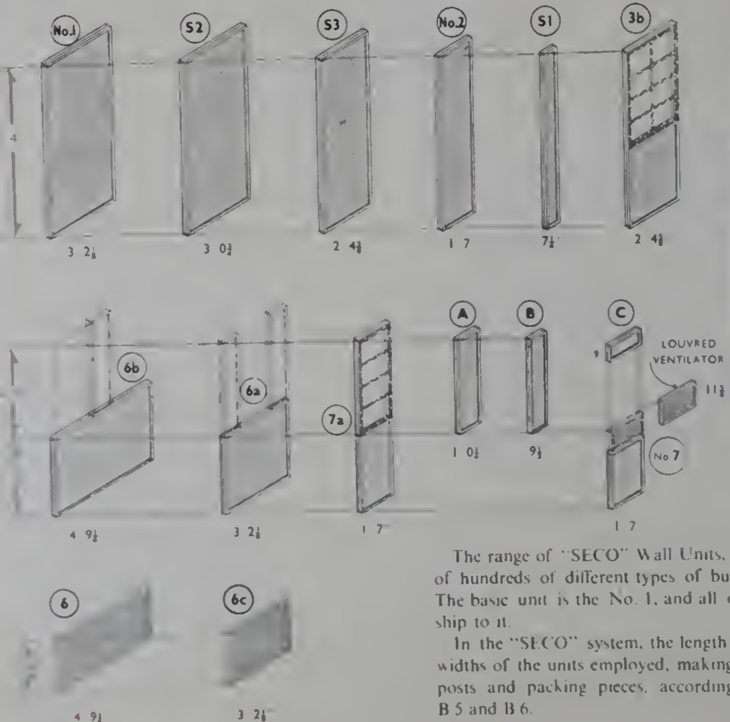
A groove is formed on the outer edge of the frame of all Wall and Door Units, and a loose Wooden Tongue fitted into it facilitates correct alignment during erection and subsequently provides weather protection at the junction between assembled units.

The fixing of one unit to another is effected by screwing diagonally through holes drilled in the unit frames. Experience has proved the speed and stability of this method of jointing.

The joint formed by the junction of the wall unit, keel-plate and foundation raft is protected by a **Baseboard**, which is designed also to provide a drip.

To give additional weather protection, the exterior joints are treated with "Secomastic" plastic jointing compound applied, when assembly of the units is complete, by means of a hand pressure caulking gun.

WALL UNITS—OVERALL SIZES



A view of a "SECO" Regional Stores, where Wall Units are stocked in readiness for delivery.

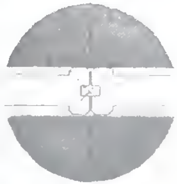
Units arrive at the sites ready for immediate erection: the only site operations necessary are placing of units, fixing by screwing, and caulking with mastic.

Both faces and all edges of the units are identical, the operative has not to decide which is the inside or outside, or which is the top or bottom, so there is no loss of time in placing.

The range of "SECO" Wall Units, which has proved adequate for the planning of hundreds of different types of building, is shown in the drawing on this page. The basic unit is the No. 1, and all other units bear a fixed dimensional relationship to it.

In the "SECO" system, the length of a wall is quickly calculated by adding the widths of the units employed, making allowance for such components as packing posts and packing pieces, according to the details of joints shown on pages B 5 and B 6.

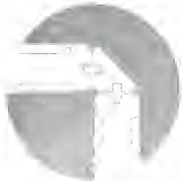
1. Basic Joint



This is the standard butt joint between unit and unit. Screws are driven at approximately 45 degrees through pre-drilled holes on the sides and ends of the frame members, indicated by dotted lines in the diagram. Holes are drilled on both faces of the frames and are located in three pairs on the sides and two pairs at the ends. To avoid coincidence, screws are driven only through alternate holes. Planning is based on a manufacturing tolerance of $\frac{1}{8}$ in. for the joints.

In erection, it is not so essential to obtain close abutment of frames as to ensure that the centre to centre distance between joints is an exact unit dimension.

2. Two Units at Right Angles

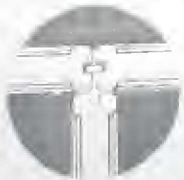


The application of the corner post, which ties the corner and provides a clean finish where two units meet at right angles. The joint occurs at each of the outside right-angle corners of the building.

3. Two Units at Right Angles with a Packing Post

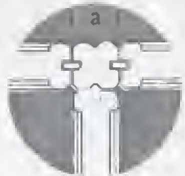
This joint occurs at the right-angle junctions of partitions. The packing post, being half the thickness of a unit frame section, serves to fill, and complete the finish of, the corner.

4. Three Units



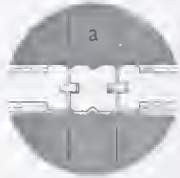
The standard joint (as Fig. 1) with a wall meeting at right angles.

5. Three Units and Packing Piece



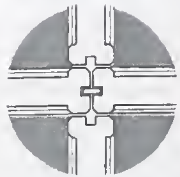
The Packing Piece is used when it is desired to compensate for the thickness of a partition wall.

6. Two Units and Packing Piece



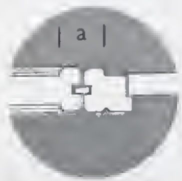
The case is similar to No. 5, excepting that the right-angle partition does not make contact—as may occur in a corridor.

7. Simple Joint between Four Units



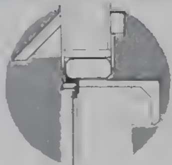
The simple joint between four units, where two walls intersect at right angles.

8. Junction between Door Frame Unit and Wall Unit



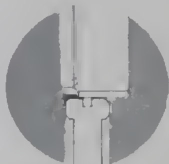
A door unit is interchangeable with any of the units shown in the foregoing examples.

NOTE.—The distance marked "a" on the drawings represents the thickness of the walls at the frames, and equals $2\frac{3}{4}$ in.



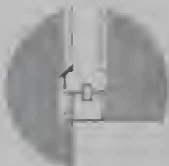
9. At Eaves Level

The soffit of the eavespiece spanning the window opening is fitted with a lintel, similar in section to the frame of the walls themselves. It is made in standard unit widths. The metal window is clipped to this lintel and to the adjoining unit frames.



10. At Sill Level

The frame of the under window panel provides a fixing for the sill of the standard metal window.



11. Section of Under Window Panel at Keelplate Level

rests on, and is fixed to, the 2 in. by 2 in. keelplate, the joint being protected by the standard baseboard.

Section 9 [illegible] of sections at window openings fitted with stand[illegible] and standard blackout surround fitment. No. 11 [illegible] of same section at keelplate level.

Plans 12 and 1[illegible] sections illustrating the method of forming corner w[illegible] runs in walls.

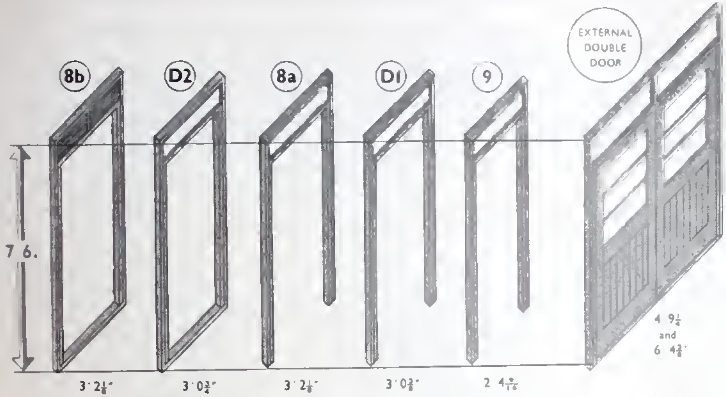
The treatment of the joints is carried out by caulking with "Secomastic."

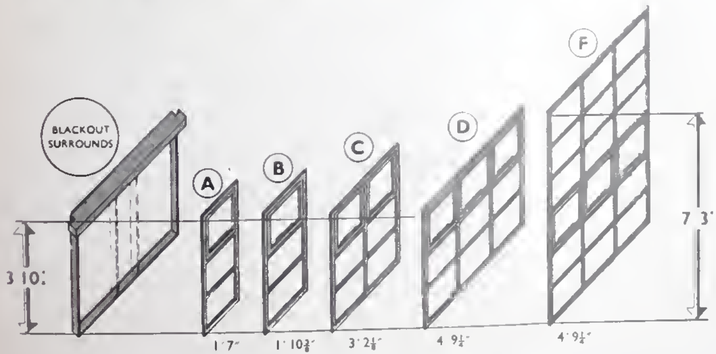
12. Bay Windows or Corner Windows

A right-angle window such as occurs at corners of buildings or in b[illegible] windows, is formed by clipping st[illegible]ndard metal windows to a packing post attached to under window pane[illegible] in the manner [illegible]trated in example 3 of wa[illegible] intersection p[illegible]ge B.5.

13 & 14.

Continuous runs of windows are formed by inserting packing posts between two under-window panels. Standard metal windows clip on in the usual manner.





Standard Door Frame Units are interchangeable with Wall Units, the unit dimensions being maintained with allowance for the keelplates, which are omitted where door openings occur.

A hardwood sill is provided to external doors and is fixed to the bottom of the standard door frame to ensure that the sill shall be flush with the finished floor surface.

The Door Units accommodate the normal standard range of doors in general use.

Door Frame Units are made with a transom, placed to receive a standard 6 ft. 6 in. door, of 2 in. nominal thickness for external doors, and 1½ in. nominal thickness for internal doors. The panel over the transom may be replaced by glass or a louvred ventilator.

Doors for special purposes, such as stores, garages, etc., are manufactured to order.

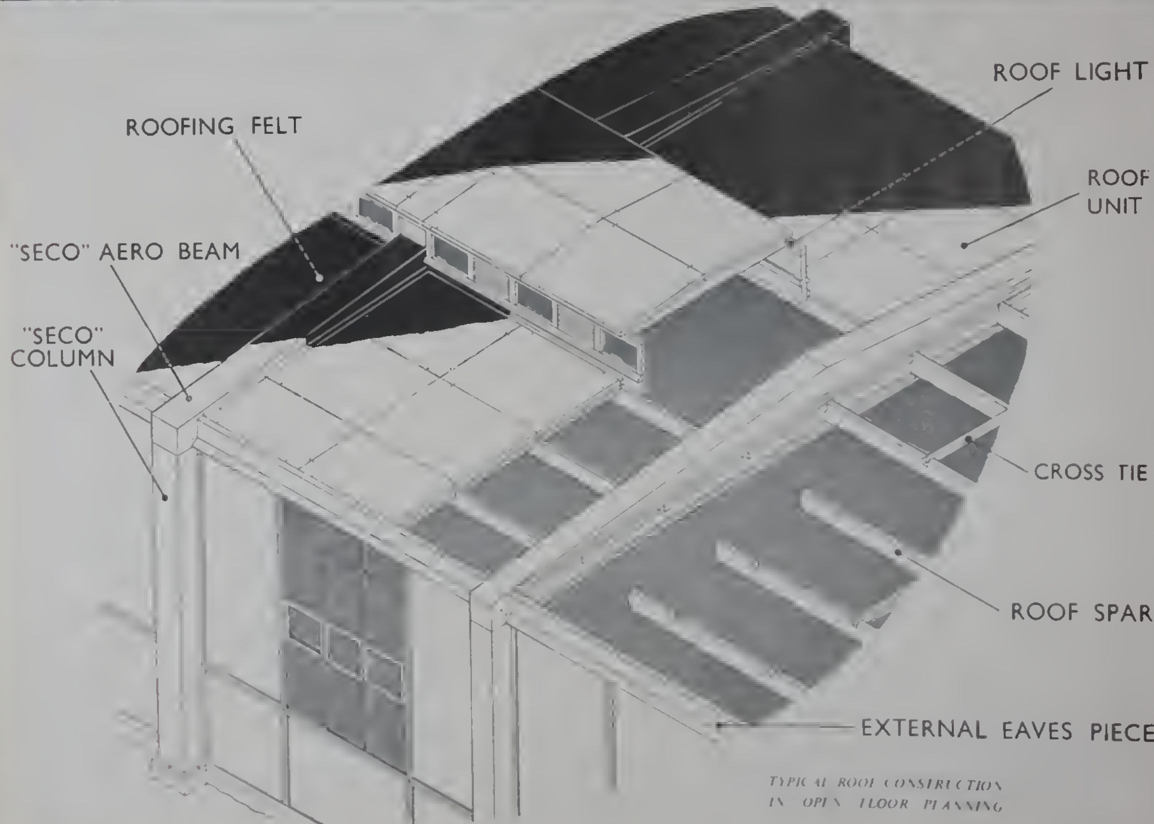
"SECO" Timber Windows

The design of the five types of wood windows illustrated is based on wartime requirements for hutments, dining-halls, etc. It is not suggested as suitable for domestic use.

The fixing of wood windows follows exactly the principle already described for metal windows, and the overall dimensions are based on standard metal window sizes.

Black-out surround fitments follow the dimensions of the window openings. The fitments are supplied with quickly detachable curtain rods.

ROOF CONSTRUCTION



TYPICAL ROOF CONSTRUCTION IN OPEN FLOOR PLANNING

THE support for "SECO" Roof Units is provided by Spars and Cross Ties, to which the units are screwed from above. The spacing and disposition of the spars and ties is dependent on the general form of construction, i.e. whether of open floor construction, employing beams and columns, or cellular construction with internal partitions.

In the former case the **Spars** span from beam to beam, being supported by two members on the sides of the beam. The lower of these members is continuous, and the upper is slotted at appropriate intervals to act as spar guide and retainer.

Where cellular construction is used, the spars span from one internal partition to another, or to the outside wall, depending on the form of planning and size of room concerned. In either case the spars are supported on members which form part of the fascia of the eavespiece, thereby transferring the roof loads through eavespieces to the walls.

The principle of fixing spars to eavespieces is like that described above for fixing them to beams.

The accompanying drawing shows a typical roof construction in open floor planning.

Cross Ties are not load bearing members, but provide lateral stability for the spars and conceal the junctions between Roof Units.

Roof Units are fixed to the roof framework by screwing from above. (The effect of screwing Roof Units to the spars and ties is to create a rigid bracing in all directions.)

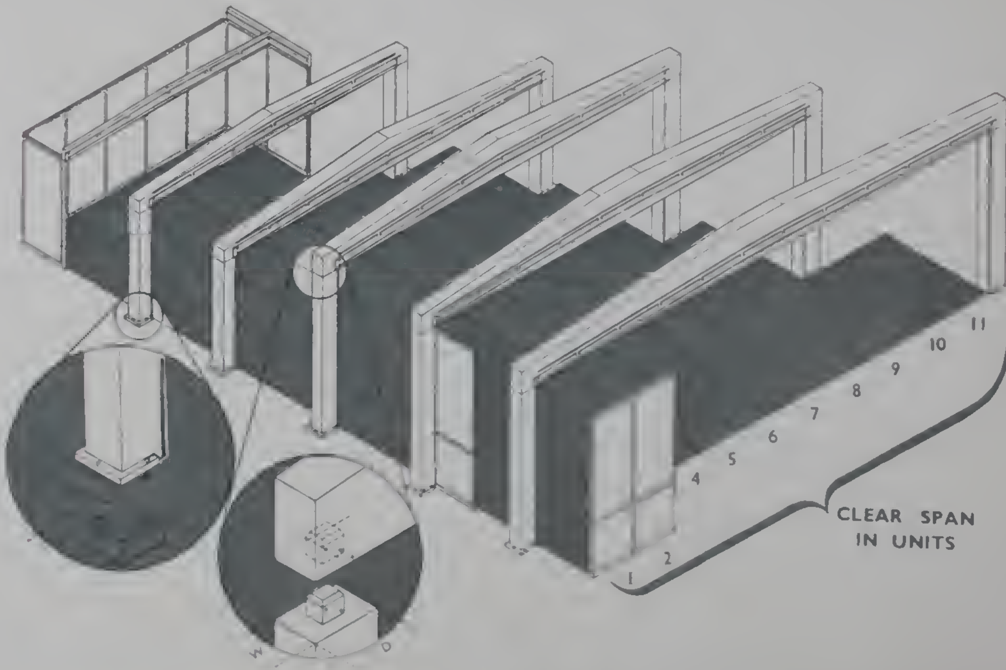
A typical **Bulkhead Ventilator** or Roof Light is shown in the diagram. This is used where extra light or ventilation is required normally only in wide-span buildings.

The whole of the roofing area is made watertight by the application of roofing felt.

"AERO" BEAMS AND COLUMNS

"SECO" "Aero" Beams and Columns are scientifically designed hollow units, built up from plywood, in order to achieve strength coupled with lightness and economy in materials.

"Aero" Beams are manufactured in spans bearing exact relationship to the standard unit dimensions. The lightest of the range has a span equivalent to five No. 1 Wall Units. The largest, in the present standard range, spans the equivalent of eleven No. 1 Wall Units, i.e. 35 ft. 0¼ in. in the clear.



The drawing on page 10 shows the complete range of "SECO" beams and columns in relation to the unit widths. With the three longest spans, a high column has been illustrated, but it will be appreciated that either high or low columns may be used for all spans.

Beams spanning the equivalent of six or more units rest on their columns and are positioned by mortice and tenon joints. The light "Aero" Beam, spanning five units, is supported either on the abutting frame of the units themselves or on a packing piece inserted between units. The base of each column is provided with holes to take hook bolts for securing it to the foundation raft.

The soffits of all beams are cambered to allow for the deflection resulting from superimposed loads.

Official test results are included in the section dealing with Physical Properties of the "SECO" System.

"SECO" BEAMS

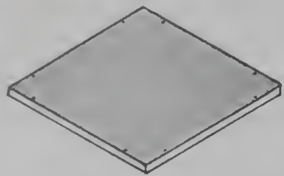
CLEAR SPAN		OVERALL		
IN UNITS	MEASURE	HEIGHT*	LENGTH	WIDTH
6	19′ 1½″	19″	20′ 7½″	10⅛″
7½	23′ 10⅞″	23⅛″	25′ 10⅞″	10⅛
8	25′ 6″	27″	28′ 1″	10⅛″
9	28′ 8¼″	31″	31′ 3¼″	10⅛″
11	35′ ¾″	34¾″	37′ 7¾″	10⅛″

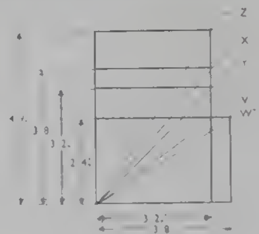
*"Height" refers to the maximum rise in the centre.

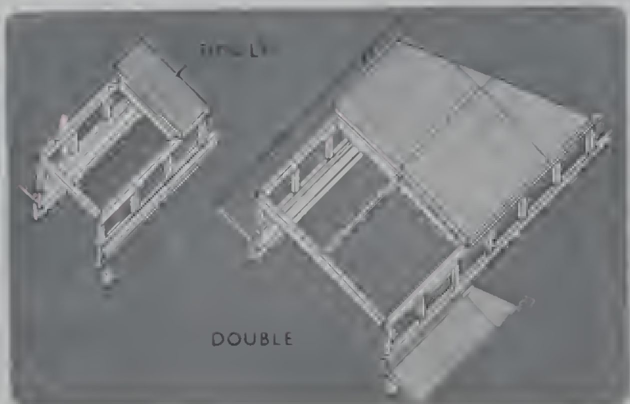
"SECO" COLUMNS

USED IN CONJUNCTION WITH	OVERALL HEIGHT	W WIDTH	D DEPTH
No. 1 Standard Wall Unit . . .	7′ 6¼″	10⅛″	9″ / 12″ / 15½″
No. 1 Wall Unit plus Plinth Unit . .	10′ 10⅜″	10⅛″	9″ / 12″ / 15½″

C DESIGN
D ERECTION
E PHYSICAL PROPERTIES







ROOF UNITS

THE construction of "SECO" Roof Units is similar to that of Wall Units, without the projecting timber frame; thus, the insulating qualities of the roof are virtually identical with those of the walls.

All Roof Unit dimensions bear an exact relationship to those of the Wall Units.

The standard sizes of Roof Units are tabulated on the left.

With this range, it is possible to roof all buildings in the "SECO" System.

BULKHEAD ROOF LIGHT OR VENTILATOR UNIT

Roof Lights and Ventilator Units are made in widths equivalent to one or two unit widths, and in lengths to suit requirements.

Bulkheads are supported by the spars, and the Roof Units, which would normally fill the space occupied by the roof light, are used to form its roof.

The opening for the bulkhead upstands is dimensioned to suit standard metal ventilators, and is subdivided in length to suit the Roof Unit dimensions also.

The bulkhead is weather-proofed with roofing felt, as laid on the roof surfaces generally.

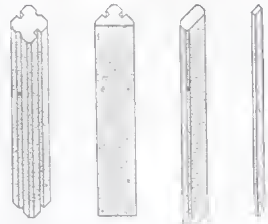
The sketches on right illustrate the range of light timber component parts used in conjunction with "SECO" Wall and Roof Units.

1. Packing piece, ex 3 in. by 3 in., equivalent in section to two standard Wall Unit Frames.

2. Corner post, ex 3 in. by 3 in.

3. Packing post, ex 3 in. by 1½ in.

4. Loose tongue, ex 1 in. by ½ in.



Components are drilled and countersunk, and are manufactured in a range of standard lengths.

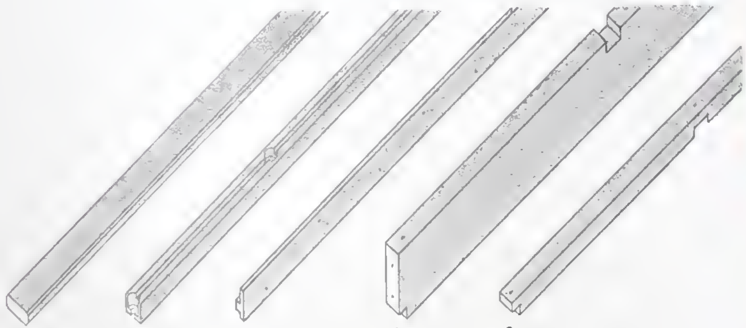
5. Lintel, ex 3 in. by 1½ in.

6. Keelplate, ex 2 in. by 2 in., drilled and countersunk to receive hook bolts and grooved for loose tongue.

7. Baseboard, ex 3 in. by ½ in., with ½ in. by 1 in. distance fillet applied.

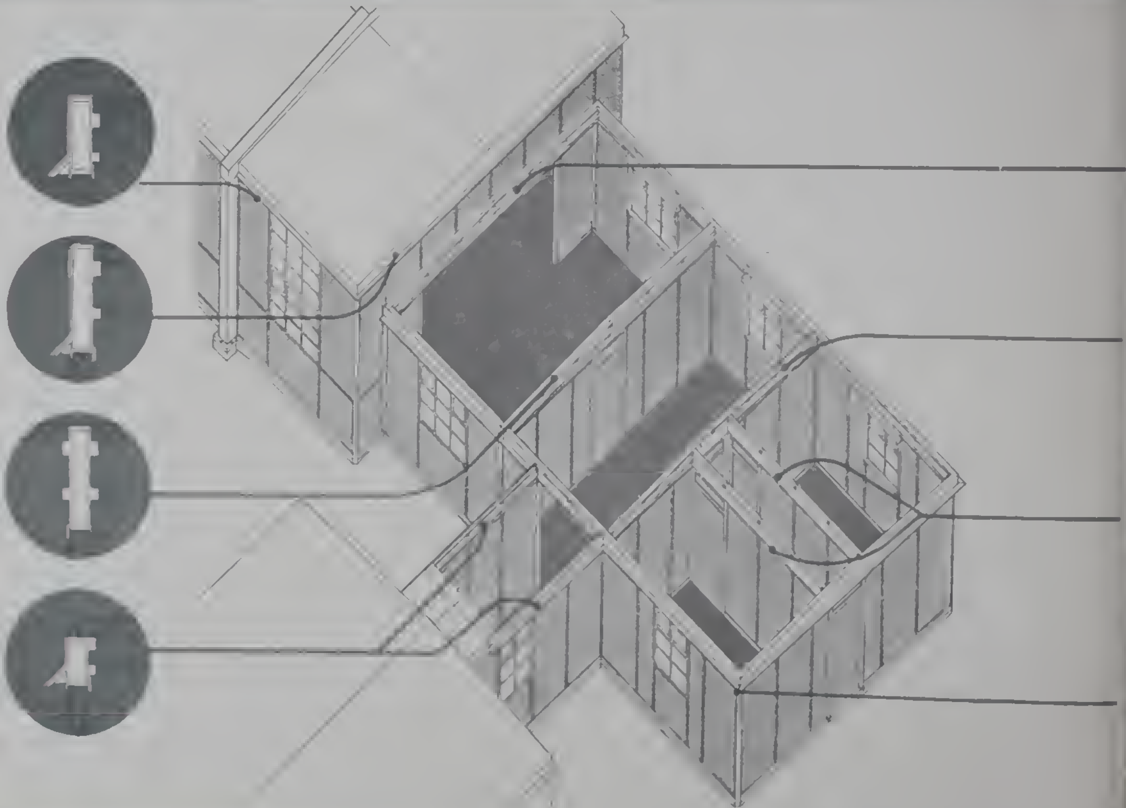
8. Roof spar, ex 8 in. by 2 in., 7 in. by 2 in., 6 in. by 2 in., 5 in. by 2 in., 4 in. by 2 in., according to span, notched to receive cross tie and rebated (in those of 8 in. by 2 in. and 7 in. by 2 in. section) to form seating on eaves or beam.

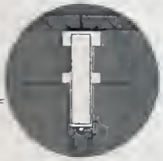
9. Cross tie, ex 2 in. by 2 in., notched to seat on spars and rebated to seat on the eaves fillet.

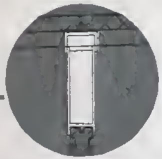


Hook bolts with washers and nuts and screws of appropriate sizes are issued with each building, together with an adequate supply of "Secomastic" "S" exterior jointing compound.

EAVESPIECES







THE term "Eavespiece" is applied to the light diaphragm structure, faced with resin-bonded plywood, which forms the connecting link between walls and roof.

There are two main types of eavespieces, external and internal, either of which may be a load bearing or a non-load bearing member.

The eavespiece is one of the most important components of the whole system, as its design controls the pitch of the roof, the direction of fall and the junction between buildings on similar or varying levels.

EXTERNAL EAVESPIECES

Load Bearing Types

This type receives the Roof Spars, through which the roof loads are transmitted. In open floor construction, load bearing external eavespieces occur only at the ends of a building, and act as gables. They are designed with a fall in both directions, equal to the fall of the roof provided by the beam. Gable-end eavespieces are constructed in one or more lengths according to span.

In cellular construction, the planning may require that roof spars bear in the direction of the pitch, in which case the load bearing eavespieces have no rake.

Non-Load Bearing Types

This type of eavespiece receives the ends of the cross ties.

All external eavespieces are provided, on their external face, with a sloping weather fillet, to give protection to window and door heads, and, on their internal face, with a fillet to receive the edge of the Roof Unit and to cover its joint.

INTERNAL EAVESPIECES

Load Bearing Types

Similar in construction and purpose to the corresponding external load bearing eavespieces, but without weather fillets.

Non-Load Bearing Types

These are virtually infilling pieces to bridge the gap between the top frame member of partition units and the Roof Unit faces.

Dimensions of all types of eavespiece bear an exact relationship to the "SECO" Unit dimension.

To allow for easy and accurate joining, the ends of eavespieces are recessed to receive loose blocks to which both ends are screwed.

Where an eavespiece meets a beam, the beam is provided with a block to receive and position the end of the eaves.

To enable eavespieces to be easily erected or demounted, a loose fillet is provided on one side.

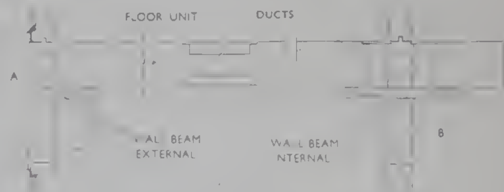
The removal of this fillet also permits an erected Wall Unit to be removed without disturbing the structure.

The internal thickness of eavespieces corresponds to the thickness of Wall Unit frames, and the undersides are recessed so that, when erected, the fascias of the eavespieces overlap. Fixing is effected by screwing through the overlaps to the unit frames.

Exterior corner weather mould pieces facilitate the forming of a clean internal or external angle.

MULTI-STOREY CONSTRUCTION

In addition to the standard wall and roof units, eaves and components already described, the following special units are required for multi-storey buildings



"SECO" Intermediate Floor Beams

Section "A" shows external intermediate floor beam with cantilever member for receiving the floor unit

Section "B" shows a partition intermediate floor beam with cantilever member on each side.

These floor beams follow the same principles of construction in resin-bonded plywood as the load bearing eavespieces described on page B 15.

The Isometric Section

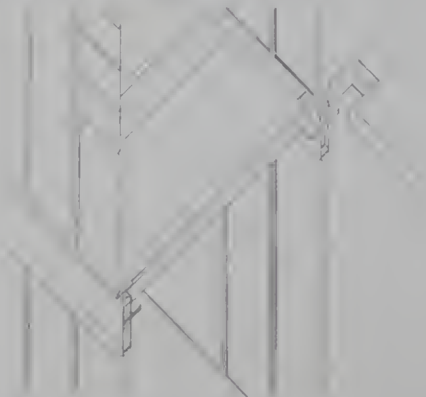
shows the manner in which intermediate floor beams, floor units and standard wall units are assembled. The floor units rest on the cantilevered members of the wall beams, and are spaced apart by distance floor fillets which seat in a rebate forming a part of the floor unit and beam design.

The spacing between floor units and between the ends of the floor units and sides of the wall beams form ducts in which electric wiring and other services may be run.

"SECO" Floor Units

The photograph above left is of a "SECO" plywood floor unit manufactured on the "Aero" beam principle. The width and length of these floor units bear relationship to the widths of wall units, and are made in spans ranging from the equivalent of two units up to four units in increments of half units.

The floor unit illustrated above spans 12 ft 9 in., i.e. the equivalent of the width of four No. 1 wall units. Its weight is approximately 130 lbs., or 3½ lbs per square foot. The floor unit is reversible, and one face forms the ceiling, the other the floor above



The "SECO" System of Unit Construction is fully protected in Great Britain and abroad by Patents, Registered Designs and Pending Patents and Design Applications

DESIGN IN "SECO"

Issued by UNI-SECO STRUCTURES LTD

6 WOODS MEWS, PARK LANE, LONDON, W.1

C
DESIGN

D

E

DESIGN IN "SECO"

● UNIT CONSTRUCTION AND THE ARCHITECT

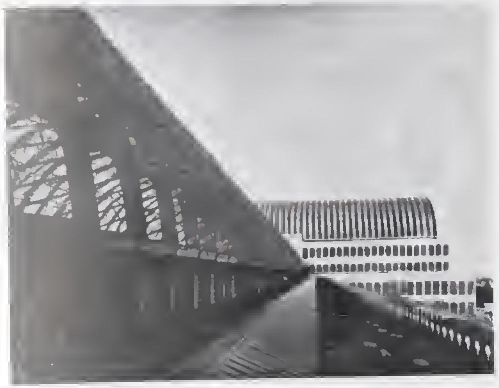
While it is true that there are many systems of prefabrication which feature the complete standardisation of houses, it would be erroneous to assume that every system must, therefore, threaten to short circuit the services of the architect.

Eight out of every ten of the houses erected in this country during the inter-war period were built without architectural guidance. Such false economy and attempts at practical standardisation possess neither the benefits of mass production nor the charms of individual design or workmanship.

Unit construction and dry assembly systems have been the aims of progressive architects for many years, and their realisation opens up new and unlimited possibilities.

A true unit system, such as "SECO", becomes a tool in the hands of the architect, with which he may create the type of building which will be required. Architects have proved that they have the under-standing and trained judgment to devise and to apply modern mass produced components. The use of standard windows, doors, rain and soil pipes and many other factory-made articles does not cramp the vision or conception of a whole co-ordinated project. It is justifiable, therefore, to assume that unit construction, in combination with the imagination and practical knowledge of architects will result in an improved building technique more suitable to our times.

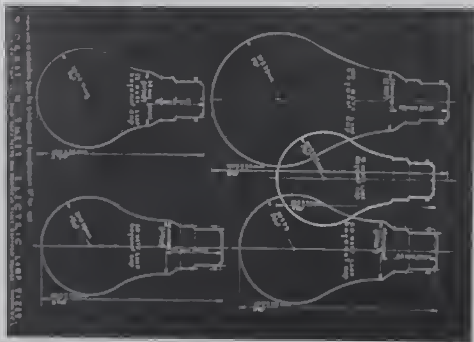
This country has always been renowned for its engineering skill, and it is significant that the construction and assembly of buildings, such as the one illustrated here (bottom right), dates back to the fifties of last century, yet, from the technical point of view, the principles, if not the materials, may be regarded as being still up to date. Elegant lightness in construction cannot be claimed to be a modern invention.



Unit construction and dry assembly of buildings are too often regarded as foreign innovations. Few people appreciate the fact that England was first in promoting this type of building design. The Crystal Palace, erected in 1851, was essentially a prefabricated building. Its erection in a period of 22 weeks, covering an area of 18 acres, was a feat which was no less remarkable than its subsequent dismantling and re-erection on its second site.

With the introduction of unit construction on an extensive scale emerges the important fact that there must be both technological and architectural integration of building components and materials. It cannot be denied that it is the architects who should be responsible for the co-ordination of all that goes into a building, but it is equally certain that they must to an increasing extent rely on the assistance of technicians if our buildings of the future are to be properly fitted with the mechanical appliances which modern conditions demand. The technological co-ordination of building components is a trend of the times and cannot be ignored.

This trend is no new feature arising from the development of systems of prefabrication



For example, it is inconceivable that in specifying electric lamps the architect should have to prepare detail designs of the sockets. This is a matter which was settled for him by technicians and manufacturers.

On the same principle, it is clear that everything of a repetitive nature which enters into the construction or the subsequent fitting out of a building will undergo processes of standardisation.

FLEXIBILITY IN PLANNING

Design in "SECO" is governed by the basic measurements of the No. 1 wall unit. Freedom of planning is, however, in no way hampered. This is borne out by the fact that over 250 individual designs have been carried out in "SECO".

These designs were invariably based on official drawings already in existence prepared by architects for traditional or other forms of construction. In no instance did it prove necessary to depart from the overall dimensions to a greater degree than a few inches, while the internal dimensions benefited by reason of the savings in wall and partition thicknesses.

EXAMPLES IN FENESTRATION

0 1 2 3 4 5 6 7 8 9

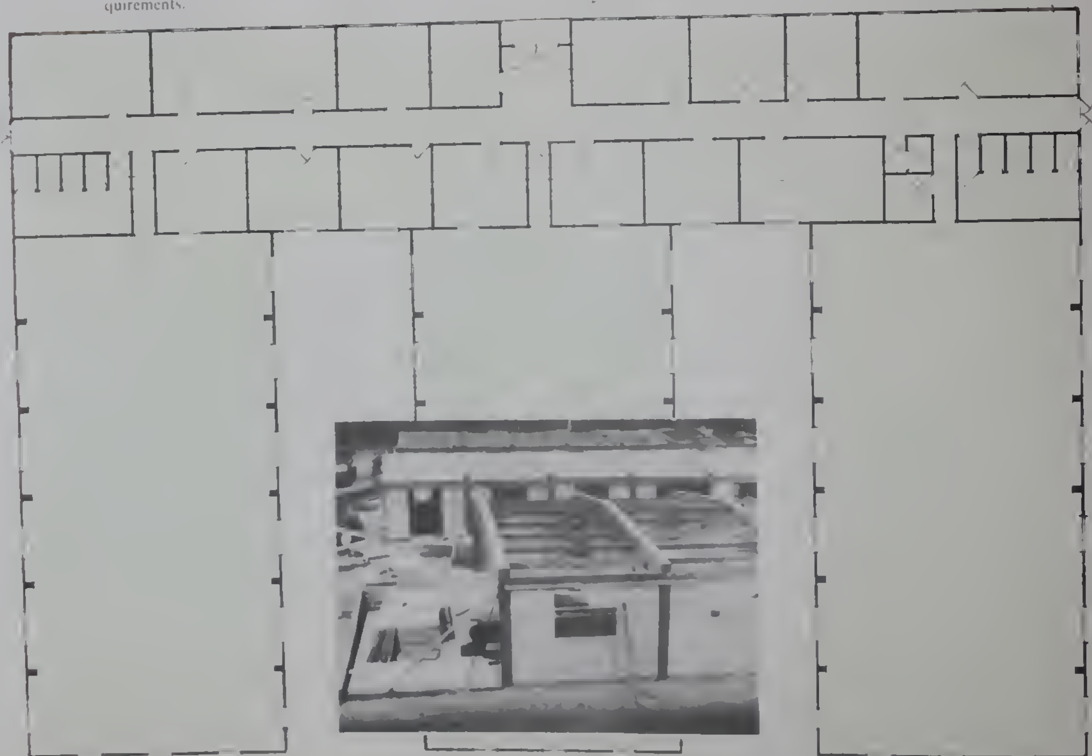
UNIT SIZES

AN almost unlimited range of combinations can be planned utilising the various sizes of standard metal windows in conjunction with standard "SECO" units and components

FLEXIBILITY IN PLANNING

COMBINATION of open floors and cellular construction. Plan of general offices in 35 ft. clear span connected with a series of rooms, varying in sizes to suit special requirements.

Overall length of building, 142 ft. 6 in.
Overall depth of building, 99 ft.
Erection man hours, approximately 1,480, equivalent to 1½ weeks with 20 men.



A photograph from the point marked **A** taken in the course of erection

— WARTIME BUILDINGS

A Canteen accommodating 3,000 people.

The two exterior wings form the dining area in 24 ft. span, 11 ft. 6 in. ceiling height construction.

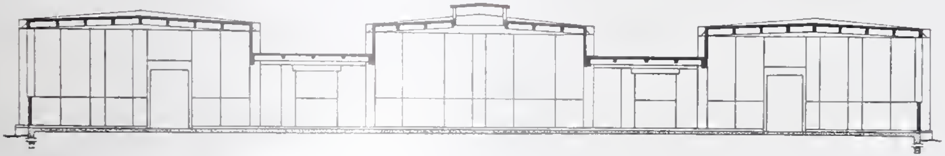
The centre wing and the body of the building form the kitchens, stores and services.

Toplight and ventilation are provided to the main kitchen sections.

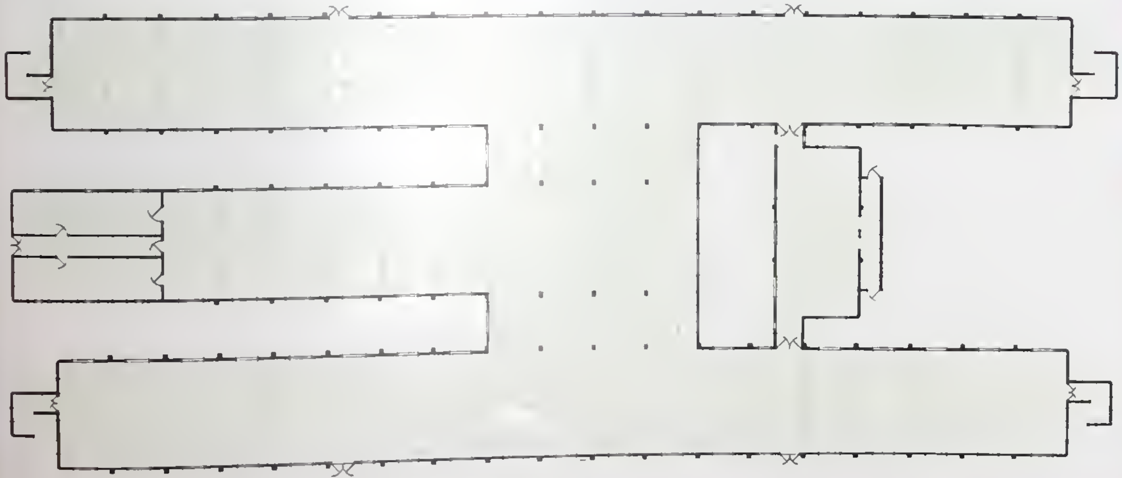
Overall length, 244 ft.

Overall width at body of building, 98 ft.

Erection man hours, approximately 2,230, equivalent to 2¼ weeks with 20 men.



SECTION THROUGH THE BODY OF BUILDING

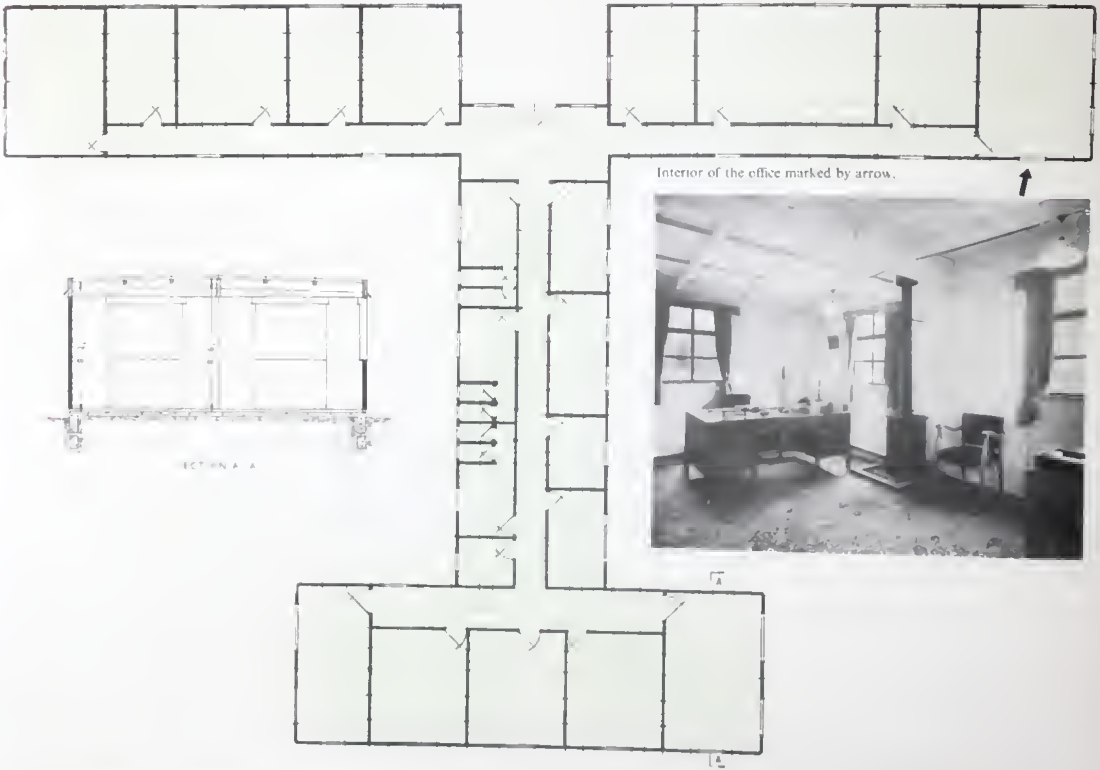


D

E

PHYSICAL PROPERTIES

Plan of cellular construction for administration offices. The layout is arranged to suit site conditions and special requirements.
Overall length, 138 feet.
Overall depth, 93 ft. 6 in.
Erection man hours, approximately 680, equivalent to under 1 week with 20 men.



Interior of the office marked by arrow.

The principles of unit construction and dry assembly are not by any means confined to large scale war-time projects. There is virtually no limitation to size or character of buildings conceived in "SECO".

Whether the Architect emphasises interior panelling effects or prefers a modern treatment of the surfaces is a matter for individual taste.

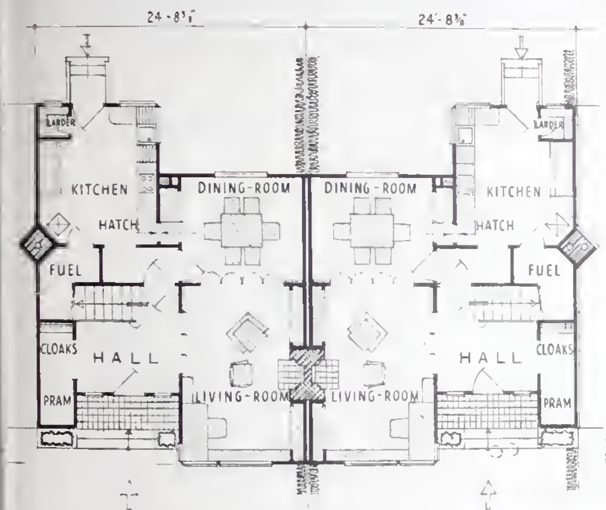
The illustration shows a variation of the same theme.

A room in a Sergeants' Mess.

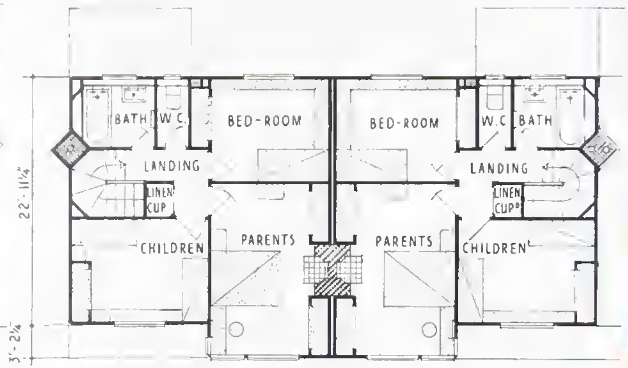
A modern living room.

An architect's preliminary sketch of a small bungalow in 'SECO'

TERRACE HOUSES

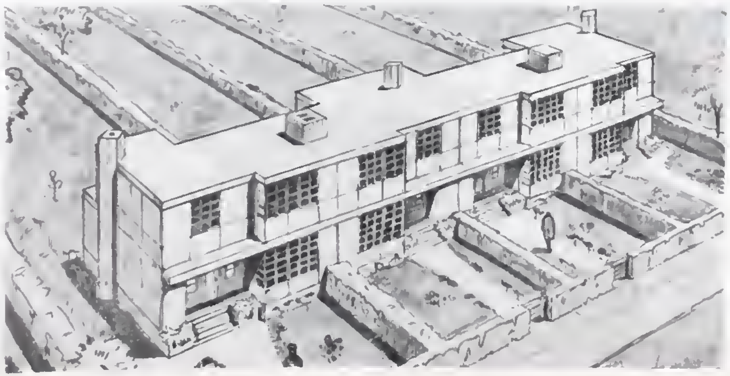


GROUND FLOOR



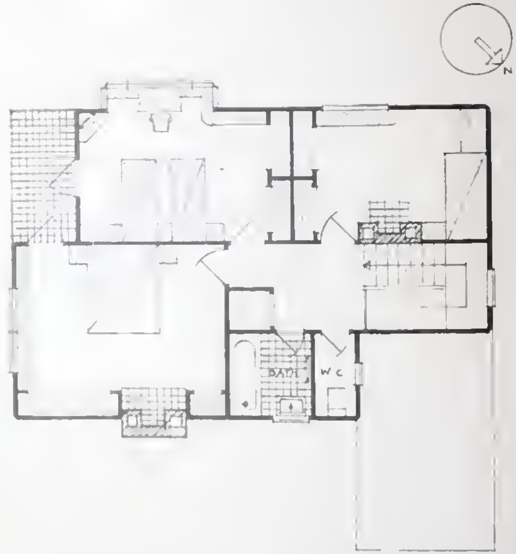
FIRST FLOOR

An architect's conception of a block of terrace houses planned in "SECO"—with due regard to the concentration of services in ducts formed by standard "SECO" wall units.



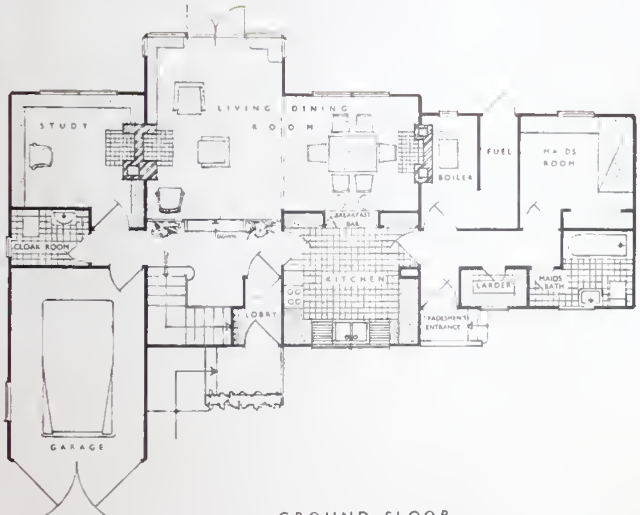
D ERECTION
E PHYSICAL PROPERTIES

GROUND FLOOR

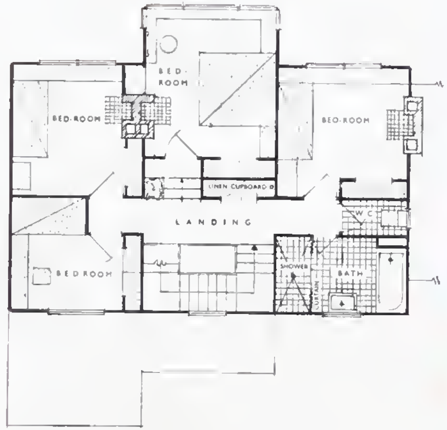


FIRST FLOOR

ARCHITECTS' DESIGN FOR A TWO-STOREY DETACHED HOUSE.



GROUND FLOOR



FIRST FLOOR

ADHERENCE TO "SECO" DIMENSIONS DOES NOT RESTRICT NORMAL DOMESTIC PLANNING PRACTICE.

SEMI-DETACHED HOUSES

Illustrations of this demonstration of "SECO" on two floors appear elsewhere in this booklet.

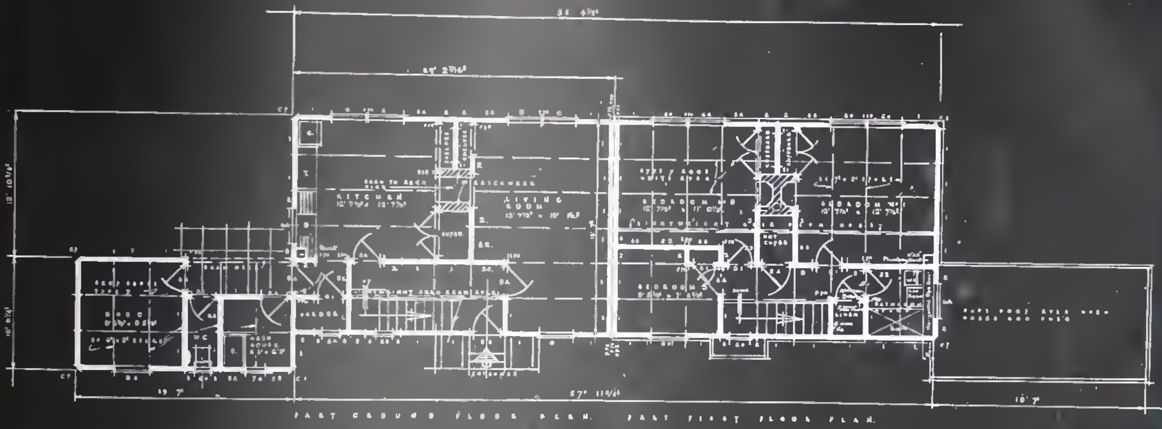
The erection procedure is explained in Section "D" by progress photographs.

"SECO" STAIRCASE

No site measurements are necessary to ensure that the staircase fits the building. "SECO" unit dimensions govern its plan.

"SECO" stairs arrive in sections of a size convenient for transport and assembly after the building is erected.

Novel constructional features have been combined with æsthetic considerations.



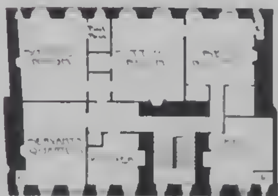
ERECTING DRAWINGS FOR THE BUILDINGS ILLUSTRATED OPPOSITE

Identification of the units and components by the reference numbers is standard practice and makes it simple to determine their correct placing. This practice has greatly contributed to the rapid erection of service buildings.

The erection time of this pair of houses was approximately 730 man hours, equivalent to $1\frac{3}{4}$ weeks for an erecting team of 8 men.

Total weight of the pair of houses, including pile foundations, is approximately 32 tons. This is less than one-tenth of the weight of a pair of houses and foundations in traditional construction to a similar plan.

THE TIME FACTOR IN DESIGN



This block of flats may be structurally strong and may remain so for many years to come, but can it be said that it provides suitable living conditions for to-day?

Social evolution and technical development have caused obsolescence to outpace dilapidation, a fact contributing to slum conditions.

In the previous pages, it has been shown that there is virtually an unlimited flexibility in planning in relation to space. "SECO" introduces, however, a new conception—flexibility in planning in relation to time.

Obsolescence of buildings is one of the problems with which we are seriously confronted in this country, and it is a problem which will remain for solution for many years to come, since little attempt was made even in recent years to provide for the demands arising from changes in social conditions and æsthetic outlook.

Internal fitments and services are liable to even more rapid obsolescence than the buildings themselves, yet the manner in which many of these have been installed makes it difficult, if not impossible, for any improvements to be made without undertaking major structural alterations.

It would be futile to attempt to forecast the trends and changes which may be necessary in heating, air conditioning and similar equipment during the next fifty years, nor do we wish to speculate as to the serviceability of our most modern buildings in 100 years' time.

The lesson of the past is beginning to be learned, and many recent references on the subject have appeared from eminent architects and politicians. To quote from one:

> "We have got to face the fact that, although in the past we have endeavoured to make our buildings capable of enduring for a century or longer, we cannot and must not, at this time, attempt to prescribe for our grandchildren and their children. Not only will they have ideas of their own, but in addition new inventions will continually be coming along, which will, in their time, make the houses that we are producing to-day quite out of date for them."*

As to the question frequently asked on the length of life of a prefabricated building, a reasonable answer is given in the following quotation:

> "Materials for prefabrication can be chosen for long or short life as required, and, what is of extreme importance, they can be chosen so as to ensure consistent longevity in practically all the structural parts."†

The question, in the future, should not be "how long will it last?" but rather "how will it perform its function of meeting conditions for which it is designed?"

For the rest, it is a matter of economics, which will adjust themselves in relation to changing conditions. Unit construction for the first time in the history of building offers the opportunity of meeting these changes in requirements, allowing for the easy replacement of obsolete parts, extensions or variations to the original plan or complete demountability if required. The wastage involved in such alterations would represent an infinitesimal proportion of the cost of modernising a traditionally built structure.

* Mr. A. C. [illegible], F.R.I.B.A., M.P., at the lunch time meeting of the Town and Country Planning Association, [illegible] December, 1943.

† Mr. R. A. [illegible], A.I.Struct.E., [illegible] *Plan*, December, 1943.

MONDAY

To demonstrate the ease with which an alteration can be made to an existing "SECO" building, the ordinary windows in the adjoining sitting rooms of the two houses were converted into deep bays.

Increased light and 30 square feet of space were added to each of the rooms. The whole operation was completed in one working day by three men.

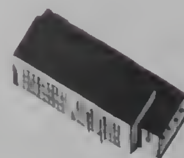
TUESDAY

PLANNING IN STAGES

The speed with which "SECO" units can be erected or exchanged on already erected buildings opens up a new vista, and introduces a dynamic element in architecture. To build the building that is needed and to plan for future extensions is no new idea in itself, but the quick and orderly fashion in which "SECO" lends itself to plans that will unroll "in time", as well as in space, makes it possible to introduce this type of planning on a much more extensive scale than hitherto

In place of the cumbersome methods associated with ordinary building construction, alterations and additions can be carried out swiftly and with the least possible interference with the functions of the existing buildings

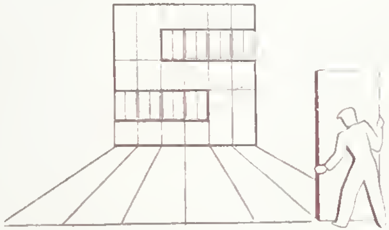
The illustrations on these pages represent a school which, as is often the case, is limited in its original plan by social, financial, or other consideration In the future, it may be necessary to make extensions. New classrooms, additional floors, covered ways, etc may be added in a matter of days, instead of months



An Architect with knowledge and appreciation of the requirements of Architects was primarily responsible for the design of the detail of the "SECO" System. We confidently believe that "SECO", whether in part or in whole, has its place in buildings of all types. We invite Architects to make full use of the experience of our Technical Staff when considering new building projects.

Our acknowledgments are due to Messrs. Architectural Press, Ltd., for their permission to reproduce the photograph on page C 1 (bottom), which appeared in the "Architectural Review," 1939, and the illustration on page C 2, which appeared in the "Information Book" by Sir John Burnet, Tait & Lorne.

The photograph on C 1 (top) is reproduced with the permission of Messrs. Topical Press Agency, and we also thank Messrs. Batsford, Ltd., for their kind permission to reprint the two pictures appearing on C 14.



ERECTION OF "SECO" BUILDINGS

Issued by **UNI-SECO STRUCTURES LTD**

6 WOODS MEWS, PARK LANE, LONDON, W.1

D

E
PHYSICAL PROPERTIES

ERECTION OF "SECO" BUILDINGS

In the following pages of this section, which is primarily addressed to Contractors, the procedure of erection of "SECO" buildings is briefly explained with the assistance of progress photographs. Three examples of construction have heen selected.

The first is of a demonstration building representing typical open-floor construction, as extensively supplied for war-time service requirements. Buildings of this type have varied in size from small picket posts of standard height to large high-ceiling canteens for feeding 3,000 personnel. The example illustrates high-ceiling 24 ft. clear span building, combined with standard height extension of cellular construction comprising two rooms with a central corridor.

The second example is of a pair of cottages for the emergency housing of key agricultural workers, typical of the standard type of married quarters plan to which we have supplied a large number throughout the country.

The third example represents a departure from war-time practice, being a double-storey pair of cottages based on a plan prepared by a technical body, suggesting suitable accommodation for immediate post-war use for workers in rural areas.

In each of the three examples, planning has been restricted to meet utilitarian requirements and no attempt has been made to **introduce architectural relief.**

The captions to the photographs of example one, of open-floor construction, have been written in the form of an abridged erecting specification. It is hoped thereby that the ease of erection of "SECO" buildings will be better appreciated by those who are not familiar with the System.

On the map on the left are marked the locations of our Regional Stores and of all the "SECO" Manufacturing Centres which have contributed to the supply of the many hundreds of thousands of units and component parts erected as buildings during the last two years.

To meet the increased demands which peace-time housing may create, provisional arrangements have been made for the extension of the chain of "SECO" Manufacturing Centres and Regional Stores, so that local requirements may be supplied with the minimum of delay and with the maximum of economy in transport.

CONTRACTORS WHO HAVE ERECTED "SECO" BUILDINGS

One of the most gratifying features of the introduction and establishment of the "SECO" System has been the manner in which Contractors have received the innovation and have so enthusiastically engaged in the work of erection.

For their willing co-operation we owe a very sincere debt of gratitude to some 200 firms, large and small, all over the country.

In the belief that the nucleus of an important nation-wide organisation was in the process of being created with an accumulating experience of "SECO" erection, which could be usefully employed in the post-war period, we decided to compile a record of all the firms with whom we came in contact, and whenever possible we have included details of the Agents in charge on Sites, Site Foremen and others concerned.

This shadow organisation can, if called upon, prove a valuable asset to the Nation when the call comes to the building industry to make a co-ordinated effort towards the rapid execution of emergency or permanent peace-time housing programmes.

It is with pleasure, therefore, that we announce on these two pages the names of the firms who have engaged upon our work, and if it should happen that any has been inadvertently omitted, we hope that we shall be notified, so that our records may be brought fully up to date.

Acme Building Company, NORTHAMPTON
Anglo-Scottish Construction Co. Ltd., LONDON
Arnold, Arthur J., Ltd., CHELMSFORD
Arnold, Harold, & Son Ltd., DONCASTER
Ashton, Henry, Ltd., BARTON-ON-HUMBER
Atherton Bros. (Blackpool) Ltd., BLACKPOOL

Batchelor, Hedley V., Ltd., FLECKNEY, nr LEICESTER
Bates, Thos., & Son Ltd., BURY ST. EDMUNDS
Beddall, Hall, & Co. Ltd., LONDON
Bell, N. B., & Co. Ltd., LEEDS
Berg, F. A. L., Limited, ESHER
Bilton, Percy, Ltd., PINNER
Bissett, John, & Sons Ltd., ABERDEEN
Blake, James, Ltd., ABERDEEN
Boot, Henry, & Sons Ltd., SHEFFIELD
Booth, J. F., & Sons, BANBURY
Bosworths & Co. Ltd., NOTTINGHAM
Bovis Ltd., LONDON
Boyd & Murley Ltd., READING

Bragg Bros. Ltd., BIRMINGHAM
Brightman, Charles, & Son Ltd., WATFORD
Broad, F., Ltd., MALVERN
Brown, Fraser & Co. Ltd., GLASGOW
Brown, J., & Sons, NEWMILNS, AYRSHIRE
Brown, L., & Co. Ltd., WILMSLOW
Bryant, C., & Son Ltd., BIRMINGHAM
Buckle, R. A., ANGLESEY
Building & Public Works Construction Co. Ltd., SWINDON
Burgess, F. H., Ltd., LONDON
Burnett, F. J., WRINGTON
Bushell, J. T., Ltd., ST. ALBANS

Chivers, W. E., & Sons Ltd., DEVIZES
Coleman, Ernest, Ltd., EAST KIRKBY
Coles, A. N., PLYMOUTH
Conlon, Peter, OLD TRAFFORD
Cook, W. T., & Co. Ltd., BECKENHAM
Cooke, T., BROUGHTON ASTLEY
Co-operative Wholesale Society Ltd., MANCHESTER
Costain, Richard, Ltd., LONDON
Courtney, William, (Contractors) Limited, ILFORD
Crosby, J., & Sons Ltd., HALE
Cryer, J., & Sons Ltd., FLEETWOOD

Dale, William, & Sons, LERWICK
Daniels, J., COVENTRY
Davis (Contractors) Ltd., LONDON
Dove Bros. Ltd., LONDON
Downing, Rudman & Bent, Ltd., CHIPPENHAM

Edwards, J. B., & Co. (Whyteleafe) Ltd., KENLEY
Ekins & Co. Ltd., HERTFORD
En-Tout-Cas Co. Limited, SYSTON

Fassnidge, Son & Norris Ltd., UXBRIDGE
Firth & Sons, RICCALL
Foster, G., Ltd., BROADWAY
Foster, Charles S., & Son, LOUGHTON
French, W. & C., Ltd., BUCKHURST HILL
Furneaux, F. J., CHRISTCHURCH

Galbraith Bros. Ltd., London
Gaze, W. H., & Sons Ltd., Kingston-on-Thames
Gee, Walker & Slater, Ltd., London
Gerrard, J., & Sons Ltd., Manchester
Gleeson, M. J., & Co. Ltd., Cheam
Glyn, Rogers & Co., Brecon
Gordon, A., Ltd., Montrose
Govan, Wm., & Sons Ltd., Prestwick
Grigg & Sons Ltd., London
Groves, Alfred, & Sons Ltd., Oxon

Hadsphaltic Construction Co. Ltd., Haverfordwest
Hall, Alexander, & Son, Aberdeen
Harvey, W., & Sons, Penzance
Hart, Robert, & Sons Ltd., London

Haslam, Frank, Limited, Doncaster
Haymills (Contractors) Ltd., London
Higgs & Hill Ltd., London
Higgs, F. & H. F., Ltd., London
Holford, R., & Co. Ltd., Guildford
Holland & Hannen & Cubitts Ltd., London
Holloway Bros. Ltd., London
Hutton, C., & Co. Ltd., Woburn Sands

Ingham, Arnold, & Son, St. Anne's-on-Sea

Janes, H. C., Ltd., London

Kenman Construction Co. Ltd., Feltham
Kent, Henry, (Builders) Ltd., London
Kent & Sussex Contractors Ltd., Erith
Kettlewell, Son & Co. Ltd., Hull
Kirk & Kirk Ltd., Putney

Laing, John, & Son Ltd., Borehamwood
Lansdown Building Co. (London) Ltd., London
Lawrence, Walter, & Sons, London
Lawson, J., & Co. Ltd., Acton

Leggat, Hugh, Limited, Glasgow
Lovell, Y. J., & Sons Ltd., Harringworth
Lowe, Thomas, & Sons Ltd., Burton-on-Trent

McAlpine, Sir Alfred, & Sons Ltd., Hooton
McAlpine, Sir Robert, & Sons, London
Martin, Henry, Ltd., Northampton
Middleton & Co. (Blackpool) Ltd., Blackpool
Minter, F. G., Ltd., London
Miskin, C., & Sons Ltd., St. Albans
Mitchell, Fred, & Son Ltd., Manchester
Moorhouse & Barker Ltd., Thornaby
Moss, William, & Sons Ltd., London
Mowlem, John, & Co. Ltd., London

Neal, Harry, Ltd., London
Nelson Construction Co. Ltd., Gloucester
Nicholson, William, & Son (Leeds) Ltd., London
Nicholson & Wright Ltd., Lancaster

Page, W. J., & Son, Northolt
Parker Construction Co., Kingston-on-Thames
Parkinson, F., & Son, Blackpool
Parkinson, Sir Lindsay, & Co. Ltd., London
Pillatt, G. A., & Son Ltd., Nottingham
Pollard, G., & Co. Ltd., Taunton
Poskitts, R. K., (Beal) Ltd., Goole
Potter, Walter, & Sons, Leicester
Prestige & Co. Ltd., London
Pumfrey, Bernard, Ltd., Gainsborough

Rattee & Kett Limited, Cambridge
Rendell, F., & Sons Ltd., Devizes
Rice & Son Ltd., London
Roberts, A., & Co. Ltd., London
Robinson, Alfred, Bradford
Robson & Davidson, Dumfries
Robson, W. G., Ltd., Sheffield
Rose, H. G., & Sons Ltd., Southampton
Rowley, A. T., (London) Ltd., London

Scottish Aviation Ltd., Prestwick
Selection Construction Co. Ltd., London
Seddon, G. & J., Ltd., Little Hulton
Shepherd, F., & Son Ltd., York
Simms, W. J., Sons & Cooke Ltd., London
Sims & Russell, London
Sindall, William, Cambridge
Snelling & Rayment, London
Speirs Ltd., London
Staverton Builders Ltd., London
Stewart, J., & Sons, London
Streather, R., Ltd., Birmingham

Tarmac Limited, London
Tawse, William, Ltd., Aberdeen
Taylor, E., & Co. Ltd., Littleborough
Taylor Woodrow Construction Ltd., Southall
Thomas & Edge Ltd., London
Thompson, Ralph, Limited, Cambridge
Thornton, William, & Son Ltd., Liverpool
Token Construction Co. Ltd., London
Townson, Wm., & Sons Ltd., Bolton
Trentham, G. Percy, Ltd., Birmingham
Trollope & Colls Ltd., London
Try, W. S., Ltd., Cowley, Uxbridge
Tysons (Contractors) Ltd., Liverpool

Unit Construction Co. Ltd., London

Walker (Tooting) Ltd., Croydon
Wallis, G. E., & Sons Ltd., Maidstone
Wates, London
Welwyn Builders Ltd., Welwyn Garden City
Whittall, W. J., & Sons Ltd., Birmingham
Willmott, John, & Sons (Hitchin) Ltd., Hitchin
Wimpey, George, & Co. Ltd., Denham
Woods of Colchester Limited, Colchester
Wright, William, & Sons (Lincoln) Ltd., Lincoln

DEMONSTRATION BUILDING—

An example of Erection Procedure

OPEN FLOOR TYPE— SERVICE BUILDING

9.15 a.m.

1

1. On arrival at the site and before erection commences, the various units and components should be carefully checked against the Quantity Schedule and carefully stacked on or adjoining the foundation raft. The raft should be measured and checked against the foundation drawing.

The requisite number of hook bolts is sent in a bag, and the first operation is to thread these bolts in the holes in the keelplate, and to lay the keelplate on the foundation raft, with the bolts in the mortices prepared to receive them.

Grouting in of rag bolts is left until erection is completed.

9.35 a.m.

2

2. Erection of the walls commences at one corner of the building. It will be found easier to fix the corner post to the first units off the raft, and to place the two together in position. The second unit makes a right angle and is temporarily screwed. The loose tongue, both at keelplate and at the vertical junction with the corner post must not be omitted. During the preliminary stages of erection only the minimum number of screws, to obtain stability should be fixed. Screws of the necessary sizes are sent for each building.

As erection proceeds, it may be found necessary to ease off or tighten up the joints between units, so that compensation may be made for manufacturing tolerances. Measurements should be taken as from centre to centre of joints and not as an overall measurement of the units themselves.

9.50 a.m.

3

3. The first of the No. 1 units has been placed over its plinth and secured to the corner post. In the final screwing-up operations the horizontal joint between plinth units and upper units must be thoroughly screwed, using all screw holes at both sides of the joint, on the interior and exterior of the building.

4. All beams having a span greater than 19 ft. 7 in. project above roof level, and require a vertical roof felt operation to be carefully carried out over the projecting surfaces. These beams have a triangular felting strip screwed on to their faces. Before erection, the strips on the side of the beams should be unscrewed so that the final row of roof units in each bay will fall easily into position. To avoid losing or breaking these felting strips, they should be temporarily screwed or tacked to the top of the beams until the roof units have been erected. The men in the above photograph are in the process of unscrewing the felting strip before the beam is lifted into position on its columns.

4

10.15 a.m.

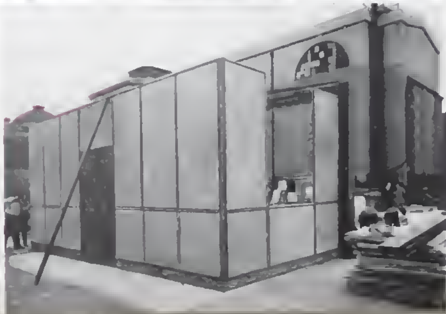
5. No special tackle is needed to lift "SECO" 'Aero' beams, though, to avoid accidents, care should be exercised by hoisting in easy stages. Screw holes are prepared on the faces of the beam for fixing to the tenon of the column. Screws must be in position before the eavespieces are erected, as the eavespieces will abut the beam end and conceal the holes.

5

10.30 a.m.

6. Erection of the walls of the end bay are now complete, ready to receive the appropriate eavespieces.

6



10.45 a.m.

E

11.15 a.m.

7

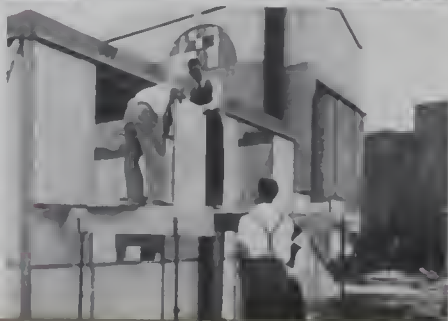
7. The eavespieces are now in position. The one forming the gable end is a load-carrying member and corresponds to the beam in its rake and fascia construction. The 7 in. by 2 in. roof spars drop into the slots and are supported by the sloping fillet. The spars are fixed by screwing to the beam and eaves from the top and from underneath. It is very important that this screwing is carefully carried out and no screws omitted.

11.30 a.m.

8

8. The second end wall of the building has been erected, and the roof construction will be complete and ready to receive the roof units as soon as the few remaining 2 in. by 2 in. cross ties have been placed in position and screwed to the roof spars from above.

12.15 p.m.



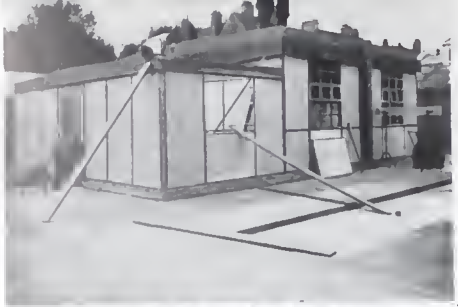
9

9. The hoisting of roof units from the ground to the roof of a high-level building is best carried out in two stages. A simple form of trestle or scaffolding, as shown above, is all the plant necessary. During the handling of roof units, care should be taken to avoid chipping off the corners, which, if damaged, would look unsightly after erection.

When the roof units have been screwed down, any open joints between them, caused by manufacturing tolerances, should be filled with cement grout. This operation is recommended, not to provide a seal for the subsequent bitumen or pitch application, but to ensure a level base for the roof

10. The felting of the roof of the high-level portion has commenced. The importance of carrying out this operation in the correct manner cannot be over-emphasised, and it is strongly urged that only experienced roofing contractors be employed. The vertical surfaces of the eaves should be treated with bitumen felt, well stuck with bitumen. In the above illustration, the bitumen felt has been cut to size and has been fixed to the weather drip to form a welt with concealed nailing.

10



1 hour after Lunch 2.30 p.m.

11. The asbestos roof surfaces require preliminary priming, after which all joints between units should be well taped. This is particularly important if fluxed pitch has been specified, for failure to tape correctly will inevitably result in the pitch running through the joints during summer weather. The sealing of the joint formed by the junction of roof units and upstand of beams should receive special attention.

11

Internal work proceeding 5.30 p.m.

12. In dry weather conditions, the decoration of the interior can proceed as soon as the roof felting operations have reached an advanced stage. Before applying the decoration, it is essential that the asbestos cement faces of the units be well primed to "kill" any trace of alkilinity.

The above illustration shows the partition wall between high-level and standard height buildings. In the interests of economy of timber, full length keelplates for internal partitions have been substituted by wood blocks of similar section. The correct finish is a cement coving formed when the grouting of the rag bolts takes place. Before these operations, any slight adjustment of alignment may be made by levering the walls.

12

6.0 p.m.

13

13. Before applying the external decorations or camouflage, all external joints between units should be filled with "SECOMASTIC" compound, a sufficient quantity of which is supplied with all buildings delivered. This is efficiently and rapidly done by using a hand-pressure caulking gun of the type illustrated.

"SECOMASTIC" 'S' soon develops a skin, but remains plastic to take up any slight movement of the timber frames.

Method of applying "SECOMASTIC" is illustrated on page 6, Section "B".

A supply of "SECOMASTIC" guns is maintained for issue on hire to Contractors.

14 THE COMPLETED BUILDING

7.15 p.m.

14. The opportunity was taken in erecting this building to demonstrate the speed of erection of the "SECO" System. Six experienced "SECO" Demonstrators, with two labourers, were engaged on the work, which commenced at 9.15 a.m. and was completed at 7.15 p.m. on the same day including "SECOMASTIC" external jointing, roof felting, glazing of windows and interior decoration.

The total man hours involved were as follows.

9.15 a.m. – 7.15 p.m.	10 hours		
Less breaks for teas and lunch	1½ hours		
"SECOMASTIC" application	8½ hours	8 men	68 man hours.
		1 man	5½ " "
TOTAL of "SECO" erection work			73½ " "
Roof felting, including lighting boiler, heating mastic and preparing felt	6½ hours	4 men	26 " "
Glazing		1 man	5½ " "
Spray painting	3 hours	2 men	6 " "
TOTAL All Trades			111 man hours.

ERECTION OF KEY AGRICULTURAL WORKERS' COTTAGES

PAIRS of cottages for Key Agricultural Workers, in accordance with a standard plan of the Ministry of Works.

Erection follows the principles described on the previous pages. The partition walls are of standard units, and act as the supporting means for the roof. No beams or columns are, therefore, necessary.

Without previous experience of the "SECO" system, the erection was completed by a local contractor in approximately 280 man hours. The weight of the units and components in this pair of cottages is approximately 17½ tons.

See also photographs on page 19, Section "A".

DEMOUNTABLE DOUBLE

1

THE photographs on these pages illustrate the progress of erection of a demountable double-storey pair of houses. The plan chosen is one prepared by a technical body suggesting suitable accommodation for workers in rural areas.

In view of the importance attached to demountability, the opportunity was taken, in erecting these buildings, to demonstrate demountability, not only of the structure, but also of foundations, thereby restoring

2

3

Precast concrete piles are driven in the required positions. Light floor beams span from pile to pile, to form the framework to receive the floor units. These fall into position and rest on the cantilever flanges on the inner sides of the beams.

The roof construction of the first floor follows the general practice of SECO one-floor buildings. Standard eaves are modified to allow the roof spars to project in order to provide a bearing for the overhang of roof units. Access from the ground to first floor is by prefabricated ply

(Continued on page [illegible])

STOREY COTTAGES

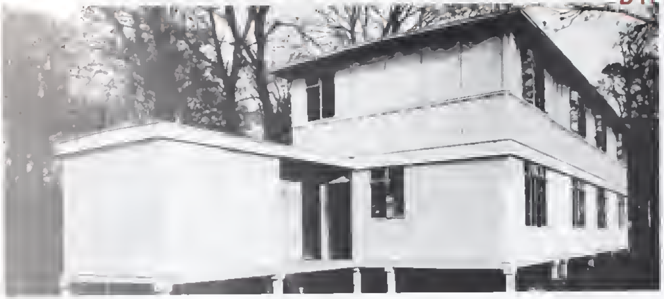
the site to its original condition in the minimum of time and with the minimum of expense.

Other photographs of this building appear on pp. 7 and 21, Section "A", pp. 12 and 15, Section "C", and plans on p. 13, Section "C".

The staircase is shown on p. 12, Section "C".

For details of floor units, intermediate floor beams, see p. 16, Section "B".

6



5

4

wood staircase, which arrives on the site in six sections.

Plumbing is prefabricated, comprising vertical duct from kitchen through first floor with a horizontal duct carrying connection to bath, basin and W.C.

Water services connect through the ducts between floor units on the first floor.

Roof areas are protected by roofing felt, dressed to form a drip over the edge of the overhanging roof units.

Total weight of structure approximately 32 tons.

Erection man hours, 730.

E

PHYSICAL PROPERTIES

DECORATION

Our Research Department is constantly carrying out tests on paints and other decorative media. In particular, we are making a study of the treatment of the asbestos cement faces of our units.

Our experience is at the disposal of Contractors.

All plywood forming part of the "SECO" System of Construction is primed before leaving factories. Timber components and unit frames are treated with wood preservatives over which normal decorations can be applied.

RAINWATER DISPOSAL

The fixing of gutters to 'SECO' buildings follows normal practice. The brackets should be screwed to the top of the eaves fascia. The roof felt is subsequently dressed into the gutter

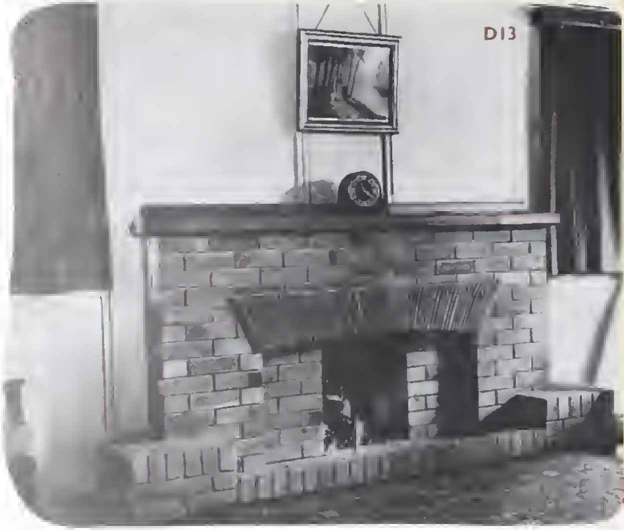
SPECIAL DOORS

For high ceiling or low ceiling buildings, garages, stores, etc., special doors can be manufactured to order.

The weight and span of some of abnormal size, such as the ones illustrated here, may make it essential to reinforce the eaves.

Sometimes it is desired to leave wide openings in special buildings.

Contractors should consult our Technical Department before taking it upon themselves to omit a run of wall units.



FIREPLACES

Brick fireplaces of many types have been added to "SECO" buildings. The usual procedure has been to build the fireplace within the building with the stack passing through the roof; alternatively to omit a unit in the walls, build the chimney breast within the building and allow the stack to project on the exterior.

ROOF FELTING

Roof felting is an operation too frequently delegated to unskilled labour. In the hands of specialist firms, the correct treatment of vertical and flat surfaces and the forming of drips is a simple process.

During the present war conditions, the authorities have permitted the use of two-ply bitumen felt bedded in bitumen on all vertical surfaces of "SECO" roofs, and it is strongly recommended that the upstands of beams as well as the eavespiece fascias should be so treated.

The enforced use of fluxed pitch for flat surfaces has made it all the more imperative to adhere strictly to approved roof felting specifications.

SERVICE TO CONTRACTORS

DEMONSTRATION—INSPECTION—FIELD RESEARCH

We maintain a staff of skilled "SECO" Erection Demonstrators, whose services are quickly available, free of charge to any Contractor engaged on our work. This same staff calls at completed sites to make reports on the condition of "SECO" buildings.

A valuable fund of information is being accumulated by our Technical and Research Departments.

"SECOMASTIC" GUN SERVICE

We maintain a stock of hand-pressure guns for hire at nominal rates.

ERECTING SPECIFICATIONS

are issued by us to Contractors erecting "SECO" buildings. These are written and illustrated in a simple manner for the benefit of foremen and charge hands.

Erection drawings are issued bearing unit identification numbers.

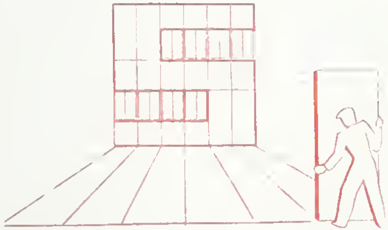
Annexe to our Head Office, erected in Double-storey "SECO". In this room are the records of all Sites, and Contractors engaged in "SECO" erection work.

ERECTION SERVICE

SELECTION CONSTRUCTION CO., LTD.

We maintain a staff of erectors with agents, foremen and complete site organisation, including mobile offices, their services are available to Contractors who may prefer to sub-contract "SECO" erection work.

The "SECO" System of Unit Construction is fully protected in Great Britain and abroad by Patents, Registered Designs and Pending Patents and Design Application



PHYSICAL PROPERTIES TECHNICAL CONTROL AND DEVELOPMENT

INFORMATION SHEETS ISSUED BY

UNI-SECO STRUCTURES LTD

6 WOODS MEWS, PARK LANE, LONDON, W.1

E

PHYSICAL PROPERTIES

INTRODUCTION

The Scientific Approach to Building

THE development of building technique in the past has been slow and laborious. It could not have been otherwise in view of the fact that it is impracticable to carry out a comprehensive series of tests on finished buildings erected in the conventional manner. There is, however, to-day a considerable amount of information relating to the physical properties of building materials. But unfortunately the properties of the individual materials give no indication as to the structural properties of the completed building. This applies particularly to materials which are assembled on the site by wet methods. For example the quality of plaster, cement or lime may be rigidly controlled, but this gives no assurance that the structures incorporating these materials will [illegible] performance. Not even the most exacting [illegible] sure that the final application is satisf[illegible] industry as we know it to-day, has in fact, developed [illegible] and error methods based on observation [illegible] operatives over a period of years.

Traditional rules are, however [illegible] title methods. The Engineering, Sh[illegible] or Car Industries have been largely [illegible] a combination of theory and prac[illegible] can apply equally to the Building In[illegible] of the site operations are transferred [illegible] can be supervised and controlled on m[illegible]

The modern building should [illegible] to those used in the Aircraft Industry, [illegible] board, the combination of theoretical and [illegible] line method of production ultimately give rise to [illegible]

Prefabrication on scientific lines [illegible] building construction so that progress in building technique can be accelerated to an extent hitherto unknown in industry. [illegible] practice can be condensed into a few years with the application of well-established scientific methods. The Building Industry can at last be brought into line with other modern industries.

In the "SECO" System of Unit Construction most of the essential operations, including all the wet processes, are carried out under controlled conditions. The System provides a means whereby the performance of completed structures may be related to the physical properties of the component parts. In fact, the more important structural properties of "SECO" Buildings may be predicted by testing finished units, joints and sub-assemblies in the factory, so that a beam or a junction between a beam and column will have the same structural strength when in the final position as they had in the factory.

TECHNICAL CONTROL

WE may regard the "SECO" System as a technological process of up-grading materials into a number of finished products, which are further converted into units and components for final assembly into buildings. A continuous system of technical control is maintained at every stage of the process from the basic materials, through the process of manufacture, to the completed unit. Production supervision, systematic inspection and testing become part of the everyday routine.

A SECTION OF "SECO" TESTING AND RESEARCH LABORATORIES

This system of technical control is carried out in the following manner:

1. Testing of Materials

ALL basic and raw materials are subjected to chemical and physical laboratory tests to ensure that they conform with specified standards, due allowance being made for circumstances arising out of war conditions.

2. Production Supervision

All component parts are subjected to regular inspection by a staff of trained technical inspectors who ensure that the manufacturing operations are carried out in accordance with specified standards imposed upon all "SECO" Manufacturing Centres.

3. Testing of Component Parts

Wall and Roof Units and all structural members are periodically subjected to load tests under conditions which simulate those to which they are subjected in practice. The test results must conform with established minimum standards, thus ensuring that uniform quality is maintained and that identical products drawn from different Manufacturing Centres will behave in a similar manner under service conditions.

4. Inspection of Component Parts

All "SECO" Products are inspected individually by members of the inspection staff at the various Regional Stores where a careful check is made on dimensions, tolerances, weights and finish, so that only those products which conform with the rigid standards laid down are despatched to the site.

5. Site Inspection

Site inspectors pay frequent visits to "SECO" Buildings both in the course of erection and at intervals after their completion. Their observations are communicated to the special Departments concerned and in this way valuable information relating to the service of these buildings is being compiled.

Considering the fact that "SECO" Buildings so far supplied in this country already cover a floor area of some five million square feet, our experience, supplemented by scientific test results, is perhaps unique in the Industry. With this as a basis we can take full advantage of any new developments that might arise from changing conditions or from the introduction of new materials.

MATERIALS OF CONSTRUCTION

Although our system of construction is novel, the building materials used at present are by no means untried. In most cases they have been in use for a considerable number of years and have given excellent service in the Building and Aircraft Industries. The illustration on the next page indicates where the different materials are employed in wartime "SECO" Buildings. It will be seen that each material has been allocated a specific purpose most suited to its characteristics and that there is no preconceived notion of using any one material throughout in preference to others.

THE "SECO" System is [illegible] specific group of products. Flexib[illegible] freedom of selection of materials. The [illegible] may be constructed of metal instead of t[illegible] may be faced with plywood, metal or other [illegible] of asbestos-cement. In fact, a wide range [illegible] may be used, provided that the replacement [illegible] by another does not essentially alter its function in the [illegible]

Wartime conditions have n[illegible] imp[illegible] restrictions both in the supply and quality of materials av[illegible]able for building. In so far as conditions allow, we have endeavoured to select those which will provide the best type of building conforming with wartime standards. As supplies of alternative materials become available after the war, we shall be in a position to provide buildings which can truly be referred to as representative of our scientific age.

The following notes will outline in brief the properties of the materials which are at present being used in the "SECO" System.

ASBESTOS-CEMENT

Sheets of asbestos-cement provide the covering in the sandwich construction of the Wall and Roof Units. Asbestos-cement is a durable, weather-resistant material which has been used in sheet form for exterior work for many years. The surface of the sheets does not crack nor craze on exposure. Both interior and exterior surfaces, after suitable priming, may be painted or otherwise treated in various ways to give pleasing and decorative finishes.

The sheets, when combined with the insulating core, provide a Unit with good thermal insulation combined with a high strength weight ratio.

INSULATING CORE

Insulation in the Wall and Roof Units is provided by chemically processed wood wool integrally bound together with cement and keyed under pressure to the asbestos-cement sheet. The insulation cannot be detached but forms part of the composite construction imparting a high degree of impact resistance to the walls and roof. The resulting cellular core is a tough, durable, fire-resisting slab, which is resistant to attack by vermin and fungus and which possesses good thermal and sound insulating properties.

TIMBER

A small amount of solid timber is used in the present system, principally in the framing of Wall and Roof Units, in the roof construction, in doors, window frames, keelplates and posts. In so far as circumstances permit the timber is carefully selected and in all cases treated with an approved wood preservative in the factory.

RESIN-BONDED PLYWOOD

The Beams, Columns and Eaves are of stressed skin construction built up of resin-bonded plywood firmly keyed to diaphragm spacing members. The use of plywood in the past has not always proved satisfactory because the glues then available were not resistant to weather or to attack by fungi. The use of thermo-setting synthetic resin glues in the manufacture of plywood has created, what virtually amounts to, a new material of construction which is finding increasing application in building for both exterior and interior use.

Plywood glued with hot pressed synthetic resins is a durable weather-resisting material immune from attack by vermin and fungus. It will not delaminate on exposure to the weather. Resin-bonded plywood is strongest at points where other plywoods are weakest, viz. the glue line. Its remarkable strength combined with its other properties renders it an ideal material for the construction of light-weight Beams, Columns and other members which are capable of supporting exceedingly high loads.

SYNTHETIC RESIN GLUES

Synthetic resin glue is used throughout the assembly of all Beams, Columns, Eaves and other structural members. The glue which conforms with Specification D.T.D.484 is waterproof and resistant to attack by fungus and provides joints which are stronger than the wood.

Although the combination of resin-bonded plywood and synthetic resin glues provides a comparatively new type of structure, the experience gained with assemblies of this kind in aircraft is sufficient testimony in itself to the high strength and durability of these materials.

ROOFING

As a wartime expedient the roofing in the "SECO" System is finished off with roofing felt laid on a mastic foundation, in accordance with current practice. The continuous roof covering provides full protection against the weather.

JOINTING

It is no exaggeration to suggest that the success of any system of prefabrication depends very largely upon the efficiency of the jointing and fixing methods adopted. An efficient system of assembly demands an equally efficient system of joining the Units together to provide weather-resistant expansion joints combined with the necessary rigidity.

"SECOMASTIC" 'S', a jointing and sealing compound, is applied to all joints in the course of assembly, providing a water-tight seal which remains sufficiently elastic over a number of years, to an extent sufficient to take care of the slight movements resulting from the expansion and contraction at the joints.

PHYSICAL PROPERTIES

We present in this Section a number of Data Sheets dealing with some of the more important tests which have so far been carried out on "SECO" Units and structural components by approved Authorities. As the results of further tests come to hand we hope to issue supplementary Data Sheets.

The tests reported show that the performance of the structural members exceed by far the requirements accepted for wartime buildings. Should the accepted standards be raised in the future by the various Ministries and Housing Authorities concerned, the System is sufficiently flexible to allow for structural changes in order to comply with the new requirements laid down.

ASSUMPTIONS

The calculations of working loads on pages E 5, 6, 7 and 10, are based on the following assumptions:

(i) Maximum distance between load bearing Walls — 12 ft. 9 in.

(ii) Weight of Roof Units — 8.4 lb. per sq. ft.

(iii) Weight of Roof Spars and Ties — 1.1 lb. per sq. ft. of roof surface.

(iv) Weight of Wall Units — 9.0 lb. per sq. ft.

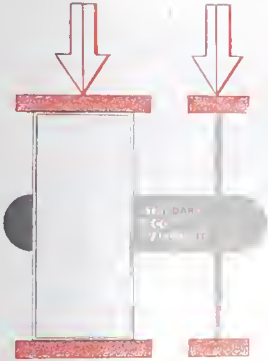
(v) Weight of Floor Units — 3 lb. per sq. ft.

(vi) Superimposed Load on Roof — 15 lb. per sq. ft.

(vii) Superimposed Load on first-floor — 40 lb. per sq. ft.

(viii) 50 per cent allowance for re-distribution of loads on to Units to provide for Door and Window openings.

COMPRESSION TEST ON WALL UNIT



Testing Authority:
R. H. Harry Stanger, A.M.I. [illegible]
Westminster, London. [illegible] F.C.S.

Description:
No. 1 Wall Unit.

Wood wool-cement faced with asbest[illegible] sheets and surrounded by a timber frame.

Overall length	7 ft. $4\frac{1}{2}$ in.
Overall width	3 ft. $2\frac{1}{4}$ in.
Thickness of wall section	$1\frac{3}{4}$ in.
Timber frame section	$2\frac{3}{4}$ in. × $1\frac{3}{4}$ in.

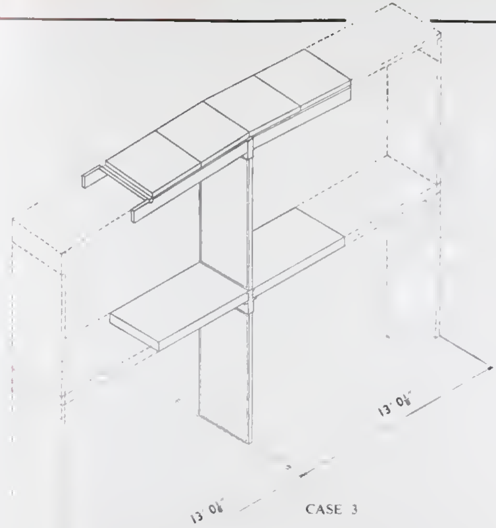
Procedure:
The Unit was tested in compression between steel platens, the load being applied to the short side as shown in the figure above.

RESULT:

No sign of failure occurred up to a load of 3.99 tons* . . . . **8,930 lb.**

On increasing the load, the Unit commenced to bulge and the sheets crushed under a load of 10.76 tons* . . . . **24,080 lb.**

* Average of three results.



WORKING LOADS:

CASE 1.—Clear span (open floor) type of construction:
To all intents and purposes, the Wall Units are non-load bearing.

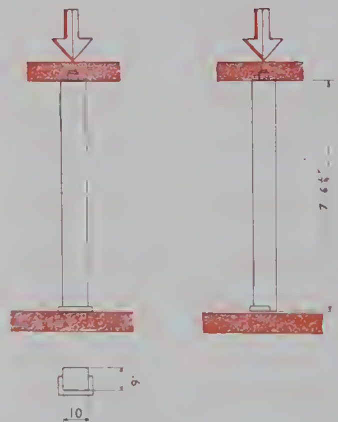
CASE 2.—Single storey buildings of cellular construction:
In this case, the weight of the roof is supported entirely by the Wall Units.

Maximum Loads:	External Walls	Per Unit	**750 lb.**
	Internal Wall Partitions	Per Unit	**1,500 lb.**

CASE 3.—Two-storey Buildings:
In this case, the roof, first-floor partitions and the floor are supported by the ground floor Wall Units.

Maximum Loads:	Ground Floor External Walls . .	Per Unit	**2,360 lb.**
	Ground Floor Internal Wall Partitions	Per Unit	**4,720 lb.**

COMPRESSION TEST ON COLUMN



Testing Authority:

R. H. Harry Stanger, A.M.I.C.E., A.M.I.Mech.E., M.I.Struct.E., F.C.S., Westminster, London.

Description:

Resin-bonded plywood fixed to diaphragm spacing members.

Overall height . . . . . 7 ft. 6¼ in.

Cross Section . . 10¼ in. × 9 in.

Procedure:

The load was applied direct to the shoulder in a vertical direction (see above).

RESULT:

The Column collapsed under a load of 16.25 tons . . . . (36,400 lb.) *

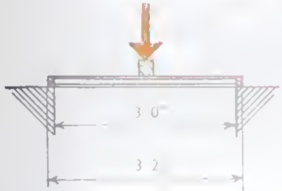
*Average of three results.

WORKING LOAD:

This size of Column is used in conjunction with Beams of 19 ft. 1½ in. clear span.

The maximum working load is . . . . **2,880 lb.**

TRANSVERSE TEST ON ROOF UNIT



Testing Authority:

R. H. Harry Stanger, A.M[illegible] Struct.E., F.C.S., Westminster, Londo[illegible]

Description:

Type "X" Roof Unit.

Wood wool bound with [illegible]s-cement sheets.

Length	[illegible] in
Width	[illegible] in
Thickness .	[illegible] in

Procedure:

The Unit was supported on bearers 3 ft. apart and the load was applied at mid-span through a bearer extending the full width of the Unit.

RESULT:

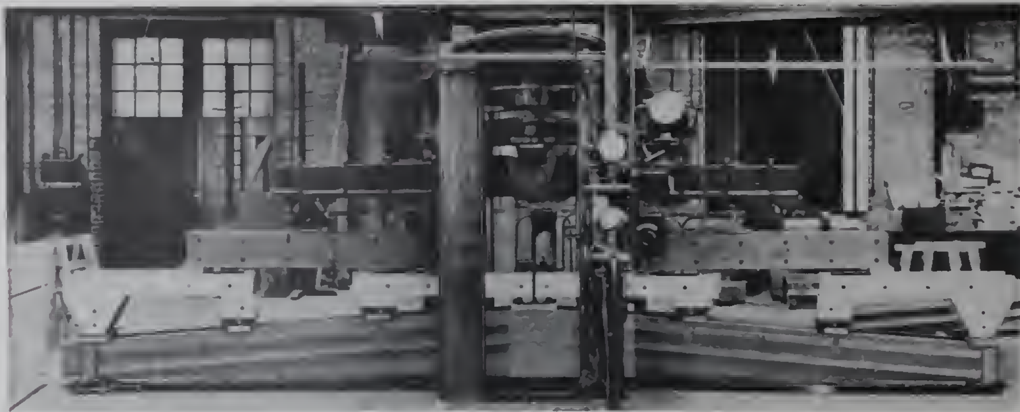
The Unit failed at a load of .. .. **1,660 lb.***

*Average of three results.

ROOF UNITS ARE SUPPORTED BY SPARS AND TIES.

IN CLEAR SPAN CONSTRUCTION, ROOF LOADS ARE TRANSMITTED TO "AERO" BEAMS.

TRANSVERSE TEST ON "AERO" BEAM



Testing Authority:

Department of Scientific and Industrial Research.

Forest Products Research Laboratory, Princes Risborough, Aylesbury, Bucks.

Description:

Resin-bonded plywood fixed to diaphragm spacing members.

Clear span	19 ft. 1½ in.
Overall length	20 ft. 7½ in.

Procedure:

The load was applied at a rate of 600 lb. per minute by means of the apparatus illustrated above.

The apparatus was arranged as shown in the illustration above. The load points were at distances of 3 ft. 2¼ in. along the Beam and corresponded to the points where the Roof Spars would be carried by the Beam.

To avoid restraint on the Beam, one end of each loading link was supported on a roller, whilst the other end was free to rotate. The deflection of the Beam at mid-span was recorded at increments of 500 lb. in the load by means of catgut stretched from end to end of the Beam and a scale fastened to the Beam at mid-span.

TEST ON BEAM No. 1

Breaking Load and Limit of Proportionality

In this test it was decided to ascertain if any increase in the deflection occurred if the load was sustained for an appreciable period at loads of 5,000 lb., 7,000 lb., 11,000 lb. and 16,000 lb. At these loads the test was interrupted and the load held for five minutes during which time any increase in the deflection was noticed. Only during the last interval with the load at 16,000 lb. was any creep measurable, and then only 0.05 in. during the five minutes.

RESULT:

The Beam failed at a load of **18,670** lb., when the measured deflection was [illegible] in.

The Limit of Proportionality [illegible] a load of approximately 14,550 lb., [illegible] deflection was 1.69 in. At load[illegible] this the deflection was proportion[illegible] applied (0.1165 in. per 1,000 lb.)

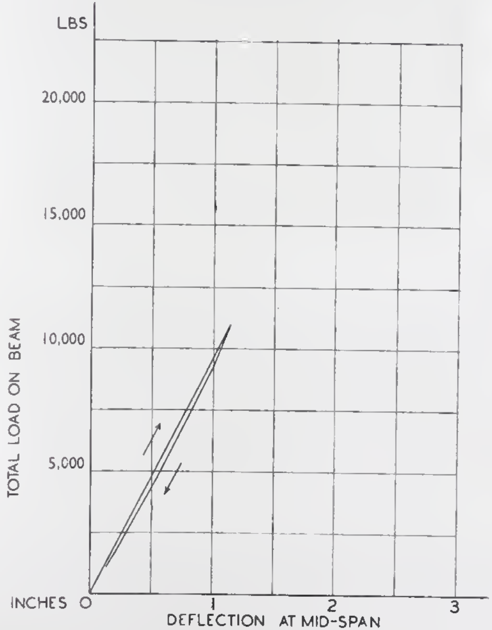
TEST ON BEAM No. 2

Permanent Set

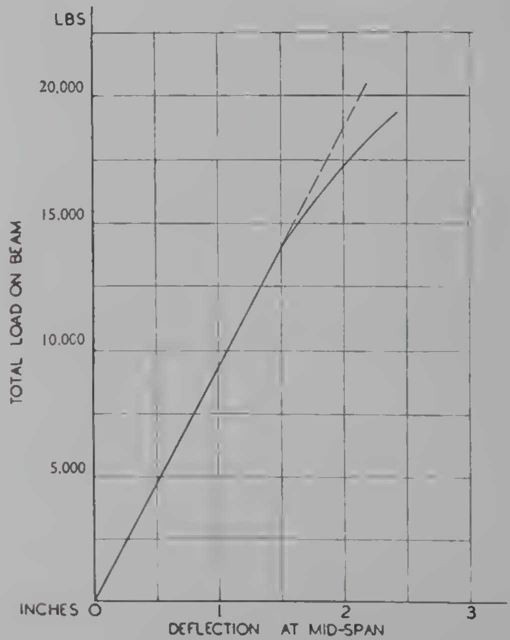
With this Beam, the load was applied without interruption up to 11,000 lb. In order to ascertain whether this loading on the Beam would result in any permanent deformation the load was then removed in decrements of 2,000 lb and readings of the deflection taken.

RESULT:

It was found that at a load of 1,060 lb. (weight of loading apparatus) there was a permanent set of 0.02 in. (see right).



TRANSVERSE TEST ON "AERO" BEAM—*Continued*



TEST ON BEAM No. 2—*Continued*

Breaking Load and Limit of Proportionality

The load was reapplied at the rate of 600 lb. per minute until failure occurred at a load of **19,630 lb.** when the deflection was 2.34 in.

Examination of the load deflection curve (see left) showed that the Limit of Proportionality was at a load of approximately 13,500 lb., at which load the deflection was 1.44 in. The increase of deflection for increase in load up to this point was 0.1067 in. per 1,000 lb.

WORKING LOADS:

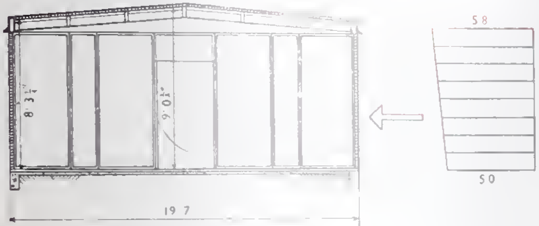
The total load on each Beam is **5,620 lb.**

CONCLUSION:

Quoted from the Test Report:

"The Beams under test failed at approximately 19,000 lb. with the Limit of Proportionality at approximately 14,000 lb. The factor of safety is thus 3.38 based on the load at failure, or 2.49 based on the load at the Limit of Proportionality.

Part of these factors is required to cover the effects of long-time loading."



Testing Authority:

Department of Scientifi[illegible]rch, Building Research Station, Garston, He[illegible]

Description:

A test was made for gener[illegible] O' building of the following dimensions:

Length ..	[illegible] 0 in.
Height to Eaves	[illegible] ft 3¼ in.
Clear internal span of [illegible]	[illegible] ft 1½ in.

Load Calculations:

"For the purpose of the test, the p[illegible]of l[illegible]ing was determined from the following considerations:

(*a*) The live load on the walls increases from 5 lb. per sq. ft. normal to the walls at ground level, by increments of 0.1 lb. per sq. ft. for each foot of height of wall.

(*b*) For estimations of the general stability of the structure, it is assumed that, (i) the horizontal force on the wall, due to the live load on the roof, may be taken as the product of the vertical projection of the roof and the pressure calculated according to (*a*) for the mean height of the roof above ground level; and (ii) the load on the wall, calculated according to (*a*) above, may be replaced by a live load at eaves equal to 0.52 times the total live load so calculated.

On the basis of (*b*) above the proof load to be applied horizontally at eaves level for general stability is 0.64 tons, or an equivalent load of 0.73 tons horizontally 1 ft. below eaves level."

Method of Test:

"The load was applied at an angle of 37° to the horizontal and along a line 1 ft. below eaves level, by wire hawsers attached to timbers bearing on the 'aerobeam' posts. The horizontal deflection was measured at the top of each post on the loaded side of the hut and at the top of two posts on the unloaded side."

TEST RESULTS:

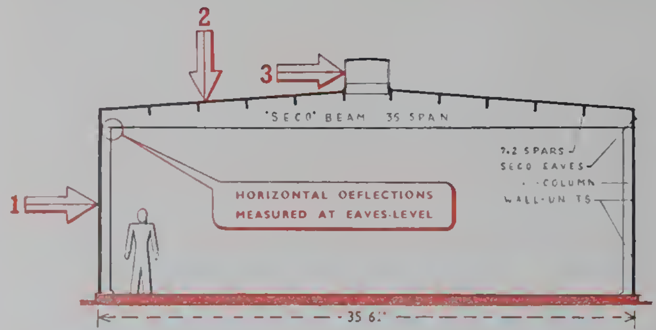
"The load was increased in three stages to the proof load at which the maximum recorded movement in a horizontal direction was 0.2 in. At 1½ times the proof load this had increased to 0.3 in. and after removal of all the load a deflection of 0.1 in. remained. The deflections of the two sides of the hut were equal.

No signs of failure were apparent during the test."

CONCLUSION:

"This hut showed less horizontal movement than any other hut already tested, and may, therefore, be considered to be very satisfactory from the point of view of stability."

STRUCTURAL STABILITY 35 FT. (NOMINAL) CLEAR SPAN



Testing Authority:

Department of Scientific and Industrial Research, Building Research Station, Garston, Herts.

Description:

A test was made for general stability on a "SECO" building of the following dimensions:

Length	83 ft. 7 in.
Height to Eaves	12 ft. 0 in.
Clear internal span of "Aero" Beam	35 ft. 0¾ in.

Load Calculations:

"For the purpose of the test, the proof loading was determined from the following considerations:

(1) The live load on the walls is 13 lb. per sq. ft. normal to the walls. It is assumed that this load may be replaced by a load, half its value, at the eaves.

(2) The live load on the roof is 5 lb. per sq. ft. on the vertical projection of the roof.

(3) The normal live load on the top-light is 13 lb. per sq. ft."

Method of Test:

"The load was applied at an angle of 28° to the horizontal and along a line 1 ft. 7 in. below eaves level, by wire hawsers attached to timbers bearing on the "aerobeam" posts. The horizontal deflection was measured at each post at eaves level."

TEST RESULTS:

"The load was increased in four stages to the proof load, at which the maximum recorded movement in a horizontal direction was ¼ in. The proof load was maintained for 1½ hours, during which time the deflection increased by about 1/50th in. Further increase of the load to 1½ times the proof load resulted in a maximum deflection of ⅜ in. After removal of all the load the horizontal deflection was 3/16 in.

No signs of failure or undue stress were apparent during the test."

CONCLUSIONS:

"The proof load applied may be taken as equivalent to the greatest wind force likely to occur at any except the most exposed situations in Great Britain.

The horizontal movement of the hut was small, even under 1½ times the proof load, and the hut may, therefore, be regarded as very satisfactory from the point of view of general stability."

HEAT TRANSMISSION TEST ON "SECO" WALL UNIT

Testing Authority:

Department of Scientific and Industrial Research, Building Research Station, Garston, Herts.

Procedure:

Two specimens 1 ft. square cut from the slabs were placed one at each side of a hot plate the whole being clamped between two cold plates maintained at a constant temperature. The temperatures of the hot and cold [illegible] were measured by means of thermocouples. The [illegible] input to the hotplate was obtained by observations of the [illegible] in its heating coil.

RESULT:

Cold face temperature °F.	Hot face temperature °F.	Heat transmission B.Th.U. per sq. ft. per hour for 1°F. difference in temperature between faces.
64	95	0·55

Taking the test figure C = 0.55 and the accepted values for surface resistances (internal surface = 0.7; external surface = 0.3) we get:

Overall Thermal Transmittance U = 0·35 **B.Th.U. per sq. ft. per hour for °F.** difference in air temperatures.

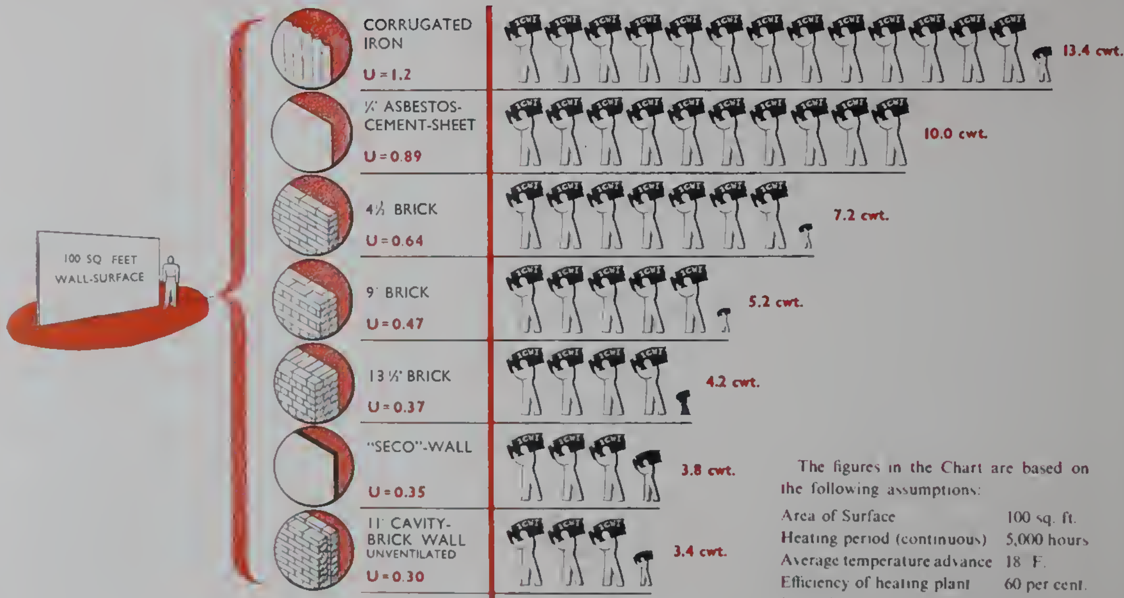
THE IMPORTANCE OF THERMAL INSULATION

With the rapidly increasing use in recent years of materials of comparatively high thermal conductivity such as steel, glass and concrete, more attention has had to be given to the problem of structural insulation in order that the very large heat losses may be reduced. Structural insulation has been advocated principally for factories where heat losses may be considerable. There is no doubt, however, that with our present knowledge of the science of heat transmission, considerably more attention will be given to the insulation not only of factories but of public buildings and dwellings.

Existing buildings are usually insulated by applying to the roof, and in some cases to the walls as well, an inner lining of rigid sheet insulating material having a low thermal conductivity. This method, it must be admitted, is only an attempt at overcoming the inherent disadvantages of traditional building materials which possess little insulation value in themselves. Progress in building technique is reaching a stage where the shell of a building will provide adequate insulation in itself without having recourse to the fixing of insulating materials after erection. One immediate solution to the problem lies in a design which incorporates composite materials in the construction which are strong and light and which at the same time possess good insulating properties. The following data and the previous test figures will show that the "SECO" Wall and Roof Units meet with these requirements.

Building insulation, however, presents a number of other advantages apart from that of fuel saving. These are discussed in further detail on page E 15.

COMPARATIVE FUEL LOSSES PER ANNUM



THE THERMAL TRANSMISSION VALUES (C) OF "SECO" WALL AND ROOF UNITS ARE IDENTICAL

The figures in the Chart are based on the following assumptions:

Area of Surface	100 sq. ft.
Heating period (continuous)	5,000 hours
Average temperature advance	18° F.
Efficiency of heating plant	60 per cent.
Fuel: Coal or coke, calorific value.	12,000 B.Th.U. per lb.

Values of U for the building materials are taken from the Fuel Efficiency Bulletin No. 12 referred to on page E 15.

ADVANTAGES OF THERMAL INSULATION

FUEL SAVING

To quote from the Fuel Efficiency Bulletin No. 12 (March 1943), on Heat Insulation, issued by the Ministry of Fuel and Power:

"It is remarkable that the financial benefits which would accrue to industry by the elimination of preventable heat loss through effective insulation have not received greater recognition. It is necessary, therefore, that attention should be focused on this factor as a practical means of achieving economy in fuel."

The relative fuel losses per annum for a number of typical wall structures compared with that for a "SECO" wall, are shown on the facing page.

SAVING IN HEATING INSTALLATION

Inasmuch as insulation reduces the amount of heat required to maintain comfortable living and working conditions, it follows that smaller heating systems will suffice in insulated buildings, thus effecting a saving in the capital cost of the installation.

WINTER AND SUMMER COMFORT

The "SECO" Units combining high insulation with low thermal capacity can provide buildings where comfortable conditions may be maintained all the year round. In winter, rooms are soon heated up and a steady comfortable temperature can be maintained. In summer, the flow of heat from the outside to the inside is retarded, and the conditions remain cool and comfortable.

ELIMINATION OF CONDENSATION

When warm humid air comes in contact with a cold surface which is below the dew-point temperature of the air, condensation of water vapour takes place. In order to prevent condensation it is necessary to maintain the surface temperature above the dew-point. In "SECO" buildings the insulated construction provides an inner surface temperature which is above the dew-point temperature. Even under extreme conditions of temperature and humidity, condensation on the inside surfaces is prevented.

RESEARCH AND DEVELOPMENT

Wartime conditions have imposed serious limitations on the type of materials available for building. Whilst the supply position might not radically alter for some years after the war, the time will soon come when many of the more established materials and some of the relatively new untried materials will become more freely available. The war has given a stimulus to the development of new materials and new processes which in turn are bound to influence the technique of building. Many of these have been used in the Aircraft and Engineering Industries with outstanding success, but have so far not found application in building construction. The progress of building methods on conventional lines has by its very nature retarded the application of new techniques acquired from other industries. Paint drying by infra-red heating, the production of heat-hardened resin finishes, methods of shaping sheet materials, are typical examples of modern processes which cannot obviously be carried out on the site.

Our Research and Development Department is conducting a programme of investigations to explore the possibilities of applying alternative materials and new processes to our System of Construction.

The following brief references will give some indication as to the scope of this work. Other possibilities will no doubt suggest themselves to manufacturers.

STRUCTURAL MEMBERS. Pressed steel. Extruded alloys. Reinforced plastics. Resin-bonded plywood. Impregnated and "compregnated" plywood. Chemically processed timber.

SHEET MATERIALS. Shaped and flat sheets. Resin-bonded plywood. Light metal alloys. Pressed fibre boards.

INSULATING MATERIALS. Pre-cast light-weight slabs. Aerated concrete. Insulation boards. Foamed plastics and rubber.

ROOFING MATERIALS. A wide range of light-weight factory-made roof units are being explored.

FLOORING MATERIALS. Pre-cast composition blocks. Flooring tiles of various kinds.

JOINTING METHODS AND MATERIALS. The application of engineering practice to the design of joints for factory-made units. Light alloys and plastic strips for decorative joints. Plastic materials for weather-proofing and sealing.

DECORATIVE FINISHES. Application of flexible and rigid sheet materials as a final finish to be applied on the site. Synthetic finishes on sheet materials processed in the factory.
Paint for decorating and finishing on the site.

Modern industry is so complex and highly specialised that no one concern can possibly cover the multitude of finished products which are required to-day. This applies even more so to the Building Industry where the potentialities are so vast that almost every branch of the Industry can make valuable and important contributions to accelerate its development.

We therefore take this opportunity of extending a cordial invitation to all industries interested in our System to discuss with our Specialist Departments the possibilities of applying their materials and processes.

With co-operation of this kind we can go forward with confidence into the future to face the responsible task of building scientifically designed homes for the people.

S
E
C
O

PREFABRICATION